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ABSTRACT

This middle school mathematics unit is organized around themes relating to sports activities in the Boston (Massachusetts) region and has a content focus on decimals and percents. The activities follow a story line which features a sports reporter (the student) and his/her assignments and adventures. Each activity begins with a headline, defines a task, and includes a follow-up question. The unit is organized by categories dealing with: (1) Sullivan Stadium (and football); (2) Fenway Park (and baseball); (3) Boston Garden (and basketball and hockey); (4) the Boston Marathon; and (5) Miscellaneous Sports. The unit could also be arranged by season, content development sequence, or activity. The materials include student worksheets, fact sheets, editor's notes, transparency masters and game cards. The math themes that extend throughout the activities include problem solving, mental arithmetic, graphing, and calculator use. The teacher's section of the unit also includes materials for mapping activities and a bibliography of related resources. (TW)

SPORTS SHORTS

THE REGIONAL MATH NETWORK

A Teacher Invigoration and Curriculum Development Project

sponsored by the

National Science Foundation

and

Harvard Graduate School of Education

This set of student materials and teacher notes is published and distributed by the Regional Math Network at the Harvard Graduate School of Education. Permission is granted to the teacher who purchases or receives this book to reproduce the materials for use with his or her students.

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FOREWORD

Mathematics is an increasingly important skill for understanding and appreciating the challenges in our society. Yet the learning of these concepts poses difficulties for many students, especially as they reach the junior high/middle school years. At the same time, mathematics teachers are leaving their profession at a rapid rate, tired of using materials that have not been revised to reflect changes in our society and its workforce. Clearly, a need exists to revitalize both the self-esteem and the teaching resources of those who have chosen this profession. The **Regional Math Network** aims to address these difficulties. The project, **funded by the National Science Foundation**, is sponsored by the Harvard Graduate School of Education.

The overall goal of the Regional Math Network is to invigorate individual teachers and to enhance the quality of the materials and techniques of those in the mathematics teaching profession. To achieve this goal, the Regional Math Network provided 22 Teacher Fellows from eleven school systems with a structured opportunity to collaborate with local business professionals and university personnel in the development of innovative teaching materials and instructional strategies. The school systems represented in the project include Acton, the Archdiocese of Boston, Boston, Cambridge, Chelmsford, Hingham, Lexington, Somerville, Waltham, and the Carroll, the Tower, and the Buckingham, Brown & Nichols Schools.

The **Regional Math Network** also seeks to stimulate math teaching in the greater Boston area. Toward that end, the Network sponsors seminars, receptions and meetings for math teachers and other interested professionals and students. The **Regional Math Network** serves as a model of collaboration on several levels: among different schools in the region, between schools and local businesses, and between these parties and the University, which primarily serves as a facilitator and resource.

A fundamental objective is to produce supplemental materials that are engaging for early adolescents and to improve their interest and ability in problem solving. The Teacher Fellows were organized into four project teams, each with a team leader and graduate research assistants. After conducting a needs and interest assessment within many regional schools and districts, each project team selected a specific context that provided the basis for the consideration of a major mathematical topic traditionally covered in the middle school curriculum. These contexts include an ice cream factory, local sporting events, the solar and space shuttle systems and Quincy Market, a local tourist and commercial area. To better understand the context, teams conferred with members of the local business community and worked with students from Harvard's MidCareer Math & Science Program, former business professionals studying to become mathematics teachers.

Each of these four context areas is linked to specific mathematical topics. While this emphasis does not exclude other related topics, teachers seeking materials on a particular topic may choose to work with a specific unit. The topics of emphasis include:

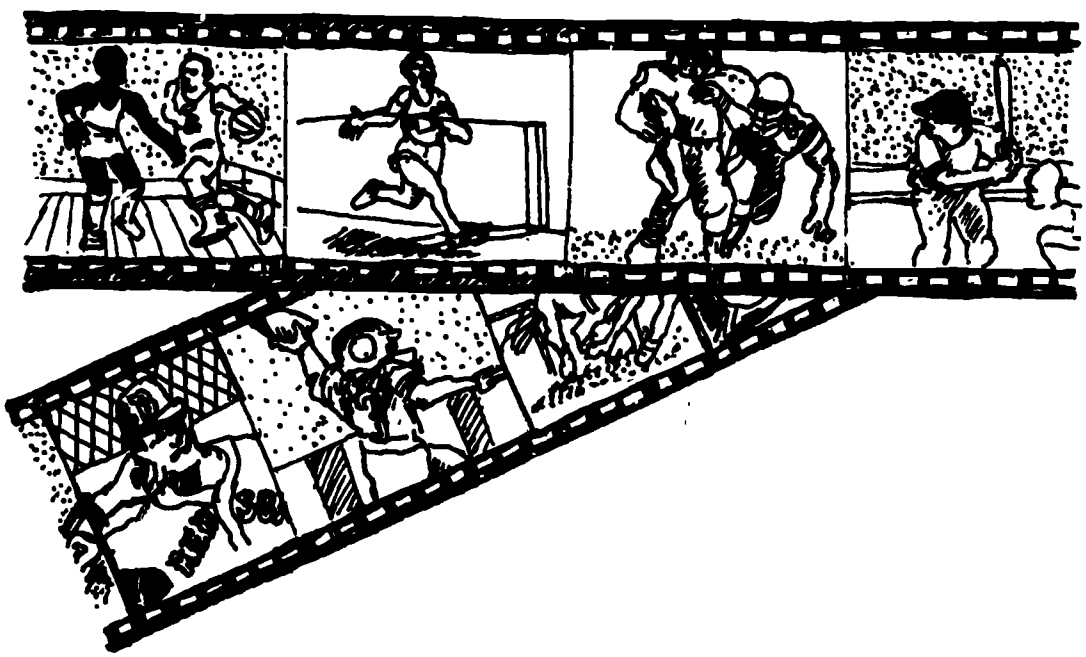
Ice Cream - Fractions
Math/Space Mission - Estimation, Geometry and Relational Concepts
Quincy Market - Ratio and Proportion
Sports Shorts - Decimals and Percents

All four of the units include a common emphasis on problem posing and problem solving. Many of the activities are open ended, encouraging students to pose their own problems for solving. Other themes and topics common to all of the units stress skills of estimation, graphing, polling, reading and interpreting charts, calculators and computer application and mental arithmetic. All of the materials stress realistic, mathematical applications that are accessible and motivating to middle school students.

Each of the units contains a variety of teacher and student resources. These include teacher notes and teaching suggestions, student pages, answers, activity cards, transparency masters, manipulative materials and classroom games. Additionally, the Quincy Market unit contains a computer disk suitable for any Apple computer.

These materials were written by teachers for other teachers to use. Hence, the materials and format are designed with a teacher's needs and constraints in mind. Comments about these materials are welcomed and may be made by writing to Professor Katherine K. Merseth, The Regional Math Network, Harvard Graduate School of Education, Cambridge, MA 02138.

SPORTS SHORTS



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CONTENTS

SPORTS SHORTS
Overview

Sports Shorts is a unit organized around the context of sports in the Boston region with content focus on decimals and percent. The activities follow a story line which features a sports reporter (the student) and his/her assignments and adventures. Each activity begins with a headline, defines a task, and includes a follow-up question which can be used in the rhetorical sense (think about it) or as a basis for class discussion or a written assignment. Many of the tasks involve gathering data for a possible article. Such articles, if actually written, may become the basis for a class or school newspaper, a sports supplement, or a magazine. Blackline masters for an editor's visor (teacher or student) and individual press cards are included in the teacher packet ("press kit") to follow the theme.

Sports Shorts activities focus on the application of mathematics skills within the context setting. As a result, most involve little instruction on the student sheets. Many are multiple concept activities. **Sports Shorts** are organized here by context categories (five in all).

Sullivan Stadium (and **Football**)
Fenway Park (and **Baseball**)
Boston Garden (and **Basketball** and **Hockey**)
The Boston Marathon
Miscellaneous Sports

Sports Shorts may also be arranged by season, content development sequence, or activity type. Charts will assist the teacher in making decisions about which activities to use and when. Teachers may choose any combination of activities depending upon available time and interest and the ability level of students. Most **Sports Shorts** activities do provide a student worksheet, record sheet, or written assignment description, but these should complement, not replace, teacher instruction, class discussion, etc.

The **Teacher Notes** are a crucial part of the package. The first items (title, objectives, nature of activity, pre-skills, materials) should help the teacher to decide whether or not to use the activity; the last two (notes and discussion/follow-up) tell how to use the activity with particular suggestions for related lessons or experiences that extend the content or context.

Several math themes extend throughout the activities. They include:

Problem Solving - Devising and using problem solving strategies (lists, charts, pictures, etc.) are as important as using computations to answer story problem questions.
Mental Arithmetic - Students should be encouraged to compute mentally, remembering that that process does not always utilize the same algorithm as the written one.
Graphing - Reading, interpreting, and constructing graphs are important skills. Data collection, graphic display, and analysis tie classroom concepts to real world applications.

Calculator Use - Practicing computational skills is not a primary objective of this unit, so calculators are often suggested although not required.

Sports Shorts activities include the following formats:

Single Worksheets which can be completed in one or two lessons.
Long-Term Activities requiring intitial instruction and short follow-up experiences on a weekly or other periodic basis over the term of a sports season or a math unit.
Template Activities providing a framework for teacher insertion of up-to-date facts from newspapers, flyers, etc. or student generation of data.
Games to motivate interest and to provide ongoing opportunities for practice and reinforcement.
Projects to provide activities for creative outlet and to motivate interest.

Teacher resources include the following:

Editor's Notes which accompany each activity and specify objectives, pre-skills, special notes, follow-up suggestions, etc.
Fact Sheets (press notes) which summarize information about Boston area sports facilities and sports. These are intended to provide teacher background as well as data for problem posing or formulating by the teacher or students.
Manipulatives (in blackline master form) which complement classroom instructions. Suggestions for use are included.
Games including rules, suggestions for use, and game cards to copy.

Sport Shorts philosophy

- Students need to be involved and **active in learning**. Measuring, surveying, generating, collecting data, designing, etc. should complement computational experiences. The idea that math is not a spectator sport is paramount in **Sports Shorts** activities.

- Mathematics applications do not always follow linear, sequential, single concept paths. Realistic applications may require **flexibility** about teaching new concepts as needed and varying the established or textbook order.

- **Student interest** in learning is heightened when personal preferences, opinions, etc. are encouraged. Material that relates to familiar names, places, and events and data that is up-to-date and recent are additional motivators.

- Middle school mathematics **class formats** vary widely. Materials that can be used in a self-contained classroom, team setting, or a departmentalized situation provide teacher flexibility. The provision for activities that extend to other areas (language arts, current events, physical education) may motivate greater interest.

- Mathematics instruction should focus on the analysis of answers and results as well as on the techniques for getting them. Discussing "what if?," "why?," "what does it mean?," often **motivate** the "how-to" and connect the classroom to the real world. **Sports Shorts** activities are designed so that the computational result is the data for the next question. The answer is a beginning not the end.

- There are numerous **resources** beyond the text that are readily available to the teacher. Newspapers, magazines, brochures, flyers, etc. provide up-to-date data and motivate student interest and awareness.

Note:

Sports Shorts activity sheets do not provide a space for student names. It is suggested that teachers establish a regular place for the student "by-line" (above headline, bottom right-hand corner, etc.).

Answers (for those activities that are not open-ended) are located on the back of the teacher notes (editor's notes) for each page.

ACTIVITY GRID & CONTENTS

		Decimals									Percents				Additional Topics								Activity Coding						
	Page Number	Reading & Writing	Comparing and Ordering	Rounding	Money Computations	+ and - Computation	x and ÷ Computation	Fractions and Decimals	Estimating Results	Metric Conversions	Meaning of Percent	Fractions, Decimals & Percents	Percent of a Quantity	Percent Increase/ Decrease	Mental Arithmetic	Estimation	Graphing	Understanding Charts	Measurment and Time	Geometry	Reading Maps	Problem-Solving	Introductory	Long Term	Open-Ended	Template	Calculator Required	Special Challenges	Specific Answers
Sullivan Stadium -Football																													
Press Notes	10																												
What's the problem at SS?	14																					●			●				
Pat's Stats	16											●					●	●						●		●			
Do I need a Calculator	21			●	●		●															●	●						●
It Hurts!	23										●		●		●								●						●
What a Way to Start the Day	25										●		●		●													●	●
Scouting the Pros - Patriots	27																						●		●				
Boston Garden Activities																													
Press Notes	33																												
What's the Problem at BG?	34																					●			●				
How Hot is Your Shot?	36							●				●											●		●				
Who's the Best?	38	●	●					●															●						●
What's the Percentage?	40		●	●			●	●																			●		●
Wow, What a Player!	42											●						●							●	●			
The Stats State It	42							●				●						●							●	●			
World Wrestling Federation	46			●	●	●	●	●	●					●	●										●			●	
Reporters Contest	50				●	●					●		●									●			●				
A Store for Sports	52										●		●		●										●				
Scouting the Pros - Celtics	54							●			●	●											●		●				
Scouting the Pros - Bruins	58							●			●	●											●		●				
Fenway Park - Baseball																													
Press Notes	62																												
What's the Problem at FP?	65																					●			●				
Hot Sox	67							●								●	●							●	●				
Time After Time	72																	●			●	●	●						●
Guess Who Came...	76	●																					●						●
May Daze	78								●												●	●	●						●
Play Ball	83				●	●	●															●	●						●
Red Sox Ticket Prices	83				●	●	●					●		●								●							●
How Embarrassing	86		●					●															●				●		●
How Does Baseball Measure Up?	88		●	●			●																		●				●
Scouting the Pros - Red Sox	91							●															●		●				

ACTIVITY GRID & CONTENTS

		Decimals									Percents				Additional Topics								Activity Coding						
	Page Number	Reading & Writing	Comparing and Ordering	Rounding	Money Computations	+ and - Computation	x and + Computation	Fractions and Decimals	Estimating Results	Metric Conversions	Meaning of Percent	Fractions, Decimals & Percents	Percent of a Quantity	Percent Increase/ Decrease	Mental Arithmetic	Estimation	Graphing	Understanding Charts	Measurment and Time	Geometry	Reading Maps	Problem-Solving	Introductory	Long Term	Open-Ended	Template	Calculator Required	Special Challenges	Specific Answers
Boston Marathon																													
Press Notes	96																												
What's the Problem at BM?	104																					●			●				
How Do You Qualify?	106																	●	●				●					●	●
Winning Women	111			●		●	●					●							●								●	●	●
Vive La Difference!	115																●	●									●	●	●
Am I There Yet?	118			●				●				●					●	●									●		●
Ten Times The Fun	121									●	●												●				●		●
Miscellaneous Sports																													
Let's Go Bowling	124										●	●			●								●						●
Are You Fit?	127	●							●							●	●	●					●						●
It's Foreign to Me	130					●	●															●	●		●				
Record Speeds	132	●				●																	●						●
Can You Imagine?	135																			●		●	●						●
How Sweet It Is!	137						●								●										●				●
Is It Worth It?	139						●								●										●				
Fans' Favorites	140								●		●	●					●			●			●						
Picturing Percent	144								●		●	●											●		●				
That's Right, It's Left	147			●				●			●	●			●								●				●		●
Sale or Scam I	150			●	●	●						●													●	●			
Sale or Scam II	150			●	●									●								●					●		
How Do You Rate?	153																						●		●				
Press Kit - Teacher Packet																													
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Map	157																												
Around the Town-Map Activities	159																			●	●	●			●				
Deci-Meter-Manipulatives	161								●		●																		
Percent Pucks-Manipulatives	164										●	●																	
It's All the Same to Me	180											●			●														●
It's All in your Mind	181											●																	●
Classroom Olympics - Intro	182					●	●																	●					
Keep Your Shirt On - Game	187										●		●		●								●						
At the Half-Game	194					●	●				●		●									●							
Sports Resources	209																												

ACTIVITY CODING

Shorts codes are given on Editor's Notes for each activity.

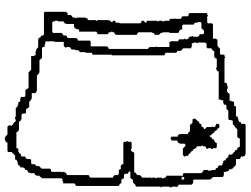
Introductory, single concept few prior skills

Open-ended, answers will vary, creative

Template (up-to-date data, clipping, etc. must be provided)

Long-term, requires more than one day

Calculator required



Special challenge

Football – Sullivan Stadium

N. E. Patriots / Sullivan Stadium Information

Sullivan Stadium was originally built at the cost of $6.7 million and financed through the private sale of more than 400,000 shares of stock in Stadium Realty Trust. The official ground breaking ceremony took place on September 23, 1970 and 326 days later (August 15, 1971) the first game was played at the new Foxboro facility. In that game, the Patriots posted a 20-14 win over the NY Giants before 60,423 fans.

With space to park 16,000 automobiles surrounding the stadium, the site covers an area of 15 acres and is as long as it is wide. In the process of excavating the bowl shape for the stadium, 250,000 cubic yards of earth were removed from the 35-feet deep hole. The J.F. White Construction Company of Newton, MA then used 15,000 cubic yards of concrete and 660 tons of steel to erect the stadium.

Sullivan Stadium has had three different field surfaces during its existence with the newest installation being completed in 1984. In 1977, the original Poly-Turf surface was removed, an entirely new drainage system installed, the field crown raised four inches and the entire field resurfaced with a Super Turf carpet. During the 1984 field resurfacing project, SuperTurf was again used to cover the Sullivan Stadium floor. Lighting is provided by three towers with 324 mercury lamps (1500 watts) which generate 200 candle power per square foot on the playing field.

Prior to the major improvement work being completed, the stadium capacity was 61,297 for football. The new stadium capacity is now 61,000 and includes 6,103 endzone seats, 710 luxury seats, 5,604 sideline chairs, 47,908 sideline seats, and 675 corner chair seats The dimensions of the field are 120 yards x 53 yards (including endzones). The field has a crown of 18".

1985

ATTENDANCE SUMMARY

	Distributed	Unused	Actual	*Act. Avg.
Preseason Total (4)	172,138	19,513	152,265	38,156
Reg. Season Total (16)	950,868	53,710	897,158	56,072
Post-Season Total (4)	316,268	7,578	308,690	77,173
All Games (24)	1,439,274	80,801	1,358,473	56,603
Home Reg. Season (8)	454,073	15,256	438,817	54,852
Home Preseason (1)	32,263	5,249	27,014	27,014
Away Preseason (3)	139,875	14,264	125,611	41,870
Away Reg. Season (8)	496,795	38,454	458,341	57,293
Home Total (9)	486,336	20,505	465,831	51,759
Away Total (15)	952,938	60,296	892,642	59,909
Away Post-Season (4)	316,268	7,578	308,690	77,173
Home Post-Season (0)	-	-	-	-

( ) indicates number of games

New England Patriots 1985 Season Results

PRESEASON RESULTS

Date	Opponent	Site	Score	W/L	Att.	Weather
8-10 (Sa)	New Orleans	Sullivan Stadium	20-32	L	(27,014)	Ptly Cldy, 78
8-17 (Sa)	Kansas City	Arrowhead Stadium	31-13	W	(35,162)	Overcast, 79
8-22 (F)	Washington	RFK Stadium	36-37	L	(50,538)	Fair, 77
8-31 (Sa)	L.A. Rams	Anaheim Stadium	13-14	L	(39,911)	Clear, 79

OVERALL PRESEASON RECORD: 1-3; Home: 0-1; Away: 1-2.
(Sa) indicates Saturday night, (F) indicates Friday night.

REGULAR SEASON RESULTS

Date	Opponent	Site	Score	W/L	Att.	Weather
9-8	Green Bay	Sullivan Stadium	26-20	W	(49,488)	Humid, 86
9-15	Chicago	Soldier Field	7-20	L	(60,533)	Sunny, 63
9-22	Buffalo	Rich Stadium	17-14	W	(40,334)	Cloudy, 70
9-29	L.A. Raiders	Sullivan Stadium	20-35	L	(60,686)	Sunny, 68
10-6	Cleveland	Memorial Stadium	20-24	L	(62,139)	Overcast, 52
10-13	Buffalo	Sullivan Stadium	14-3	W	(40,462)	Clds, Rain, 42
10-20	N.Y. Jets	Sullivan Stadium	20-13	W	(58,163)	Cloudy, 54
10-27	Tampa Bay	Tampa Stadium	32-14	W	(34,661)	Cloudy, 85
11-3	Miami	Sullivan Stadium	17-13	W	(58,811)	Drizzle, 47
11-10	Indianapolis	Sullivan Stadium	34-15	W	(54,176)	Cloudy, 66
11-17	Seattle	Kingdome	20-13	W	(60,345)	Indoors
11-24	N.Y. Jets	Giants Stadium	13-16(OT)	L	(75,100)	Sunny, 53
12-1	Indianapolis	Hoosierdome	38-31	W	(56,740)	Indoors
12-8	Detroit	Sullivan Stadium	23-6	W	(59,078)	Cloudy, 42
12-16	Miami	Orange Bowl	27-30	L	(69,489)	Clds, Rain, 67
12-22	Cincinnati	Sullivan Stadium	34-23	W	(57,953)	Sunny, 29

OVERALL REGULAR SEASON RECORD: 11-5 (Tied for 2nd AFC; Tied for 2nd AFC East).
Home: 7-1 Away: 4-4
vs. AFC East: 6-2; vs. AFC Central: 1-1; vs. AFC West: 1-1
vs. NFC East: 0-0; vs. NFC Central: 3-1; vs. NFC West: 0-0

POST-SEASON RESULTS

Date	Opponent	Site	Score	W/L	Att.	Weather
12-28	N.Y. Jets	Giants Stadium	26-14	W	(70,598)	Cloudy, 33
1-5	L.A. Raiders	L.A. Coliseum	27-20	W	(88,936)	Overcast, 67
1-12	Miami	Orange Bowl	31-14	W	(74,978)	Cloudy, 64
1-26	Chicago	Superdome	10-46	L	(73,818)	Indoors

OVERALL POST-SEASON RECORD: 3-1
Home: 0-0 Away: 3-1

1984 TICKETS/ATTENDANCE PER GAME

Date	Opponent	Distributed	Actual	Unused
9-2	at Buffalo	49,649	48,528	1,121
9-9	at Miami	67,843	66,083	1,760
9-16	Seattle	45,492	43,140	2,352
9-23	Washington	60,956	60,503	453
9-30	at N.Y. Jets	76,891	68,978	7,913
10-7	at Cleveland	54,089	53,036	1,053
10-14	Cincinnati	48,421	48,154	267
10-21	Miami	60,890	60,711	179
10-28	N.Y. Jets	60,890	60,513	377
11-4	at Denver	75,100	74,908	192
11-11	Buffalo	46,056	43,313	2,743
11-18	at Indianapolis	60,656	60,009	647
11-22	at Dallas	65,101	55,341	9,760
12-2	St. Louis	53,765	53,558	207
12-9	at Philadelphia	59,234	41,581	17,653
12-16	Indianapolis	30,771	22,383	8,388
	TOTALS	915,804	860,739	55,065
	Avg.	57,238	53,796	3,442
	At Home Total	407,241	392,275	14,966
	At Home Avg.	50,905	49,034	1,871
	Away Total	508,563	468,464	40,099
	Away Avg.	63,570	58,558	5,012

PRIOR TO 1985
ALL-TIME SERIES STANDINGS

(Includes Regular Season and Playoff Games)

Team	W	L	T	Pct.	Points For	Points Against
Atlanta	2	2	0	.500	71	91
Buffalo	26	23	1	.530	1040	1017
Chicago	2	1	0	.667	53	43
Cincinnati	5	3	0	.625	132	162
Cleveland	2	4	0	.286	106	151
Dallas	0	5	0	.000	100	150
Denver	12	11	0	.522	527	513
Detroit	1	2	0	.333	41	81
Green Bay	1	1	0	.500	47	51
Houston	14	13	1	.519	681	588
Indianapolis	14	15	0	.482	664	583
Kansas City	7	11	3	.425	381	514
Los Angeles Rams	2	1	0	.667	55	38
Los Angeles Raiders	11	11	1	.523	491	580
Miami	13	24	0	.351	704	905
Minnesota	2	1	0	.667	58	72
New Orleans	4	0	0	1.000	89	43
New York Giants	1	1	0	.500	28	36
New York Jets	20	28	1	.418	1137	1134
Philadelphia	2	3	0	.400	81	84
Pittsburgh	2	5	0	.286	126	184
St. Louis	1	4	0	.200	63	121
San Diego	13	12	2	.520	595	567
San Francisco	1	3	0	.250	64	97
Seattle	4	1	0	.800	128	78
Tampa Bay	1	0	0	1.000	31	14
Washington	1	3	0	.250	70	89
PATRIOTS TOTALS	165	188	9	.467	7476	7844

ATTENDANCE--REGULAR SEASON

Year	Home Games	Att.	Away Games	Att.	Total
1960	7	118,250	7	110,316	228,576
1961	7	115,610	7	129,984	245,594
1962	7	150,626	7	170,983	321,609
1963	7	169,870	7	143,936	313,806
1964	7	199,652	7	175,246	374,898
1965	7	143,098	7	245,485	388,583
1966	7	190,138	7	240,668	430,806
1967(a)	6	138,861	8	287,279	426,140
1968(a)	6	127,267	8	318,396	445,663
1969	7	149,412	7	284,587	433,999
1970	7	245,537	7	361,842	607,379
1971	7	411,109	7	383,143	794,252
1972	7	426,993	7	402,159	829,152
1973	7	410,443	7	416,805	827,248
1974	7	420,903	7	411,595	832,498
1975	7	411,490	7	379,112	766,426
1976	7	378,994	7	387,432	766,426
1977	7	415,959	7	399,419	815,378
1978	8	478,978	8	455,679	934,657
1979	8	478,987	8	502,492	981,479
1980	8	458,283	8	442,001	900,284
1981	8	414,741	8	413,073	827,814
1982	4	149,188	5	231,781	380,969
1983	8	370,958	8	416,024	786,982
1984	8	392,275	8	468,464	860,739
Totals:	176	7,367,632	181	8,177,901	15,545,533

POST-SEASON GAMES

1963	--	----------	2	64,314	64,314
1976	--	----------	1	54,037	54,037
1978	1	61,297	--	------ ----	61,297
1982 (1-2-83)	--	----------	1	68,842	68,842
Totals:	1	61,297	4	187,193	248,490
Grand Totals:	177	7,428,929	185	8,365,094	15,794,023

(a) One home game rescheduled and played away from home

EDITOR'S NOTES

TITLE: What's the Problem at Sullivan Stadium?

NATURE OF ACTIVITY: Problem posing

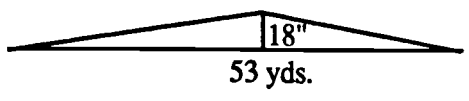
OBJECTIVES: To formulate word problems
To identify relevant data in a problem solving situation
To choose appropriate problem solving strategies

PRE-SKILLS: Some problem solving experience

MATERIALS: Fact sheets (see press kit); brochures, flyers, etc. about facility (optional)

NOTES: This activity requires students to focus on the facts in a problem situation as well as on the question and solution. Discuss "fact" sources other than those in the teacher packet (Press Kit). Students may be able to bring in program books, brochures, etc. or have information from personal trips, T.V. viewing, etc. To start the thinking process, choose one or two pieces of data and have students brainstorm to produce possible questions. Focus on fluency first, then select those questions that can be solved with the students' background in mathematics. Discuss the kinds of questions that could be asked. How many? How much more? What fraction? What percent? How many ways? What's the least? Etc.

Encourage questions that require varied strategies such as single computation, multiple computations, sketching, efficient counting, chart or list.
Plain paper may be used so the number of problems is not limited to five. Students may fold over the solution column so that problems can be posted or exchanged for sharing.

FACTS	SAMPLE QUESTION(S)	SOLUTION
The crown at Sullivan Stadium is 18". The field is 53 yds. wide.	What is the ratio that represents the slope from center of field to side?	 53 yds. $\frac{18"}{53\text{ yds.}} = \frac{1/2\text{ yd.}}{53\text{ yds.}} = \frac{1}{106}$

FURTHER DISCUSSION / FOLLOW-UP: Put some constraints on the kinds of questions that can be used. For example:

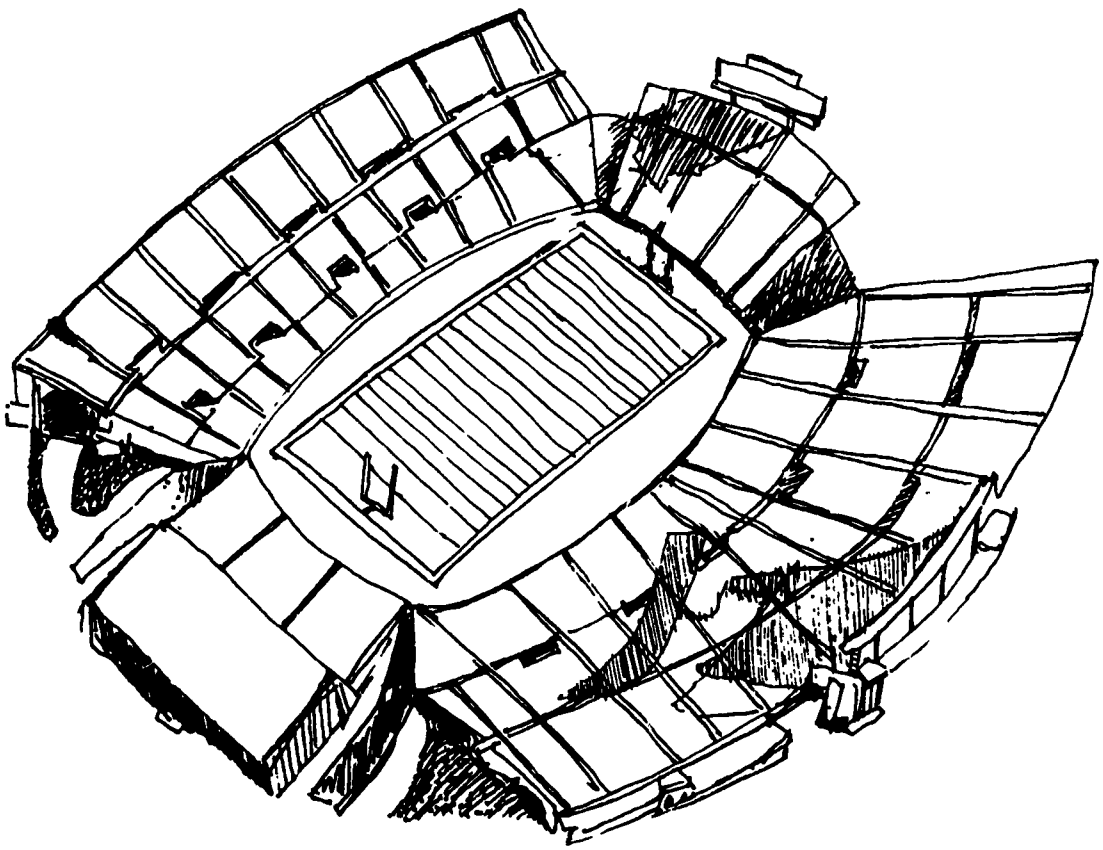
Must involve more than one operation for solution.
Must involve a particular operation(s).
Must involve a percent or decimal.
Must have extraneous data among facts.

This can be used as a bulletin board activity where the teacher posts one or more facts on a regular basis and students contribute questions (and solutions). Plan a fact or data gathering field trip to Sullivan Stadium. The problems generated could be put on 3x5 cards (with answers on the back) to become a problem solving deck. See other What's the Problem at_____ activities.

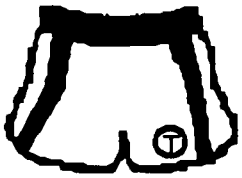
Headline: WHAT'S THE PROBLEM AT SULLIVAN STADIUM?

The Harvard Regional Math Network has asked your editor to suggest some problem solving activities that are related to sports. Guess who was assigned this challenge? You must use your resource file (as well as your memory) for facts to make up some sample problems that other students might enjoy. Record your problems in your reporter's notebook using the following headings:

FACTS	QUESTION(S)	SOLUTION(S)



EDITOR'S NOTES



TITLE: Pats' Stats

NATURE OF ACTIVITY: Longterm Graphing

OBJECTIVES: To practice developing and interpreting bar and line graphs from actual statistics
To use graphs to predict patterns
To select appropriate data from a chart or table
To strengthen visual estimation skills

PRE-SKILLS: Ability to round, ability to locate points on a graph.

MATERIALS: Three gridsheets, weekly Patriots' game statistics

NOTES: This activity requires some initial instruction on reading the stat sheet and recording the needed information. Subsequent time should be only 10-15 minutes per week. Students may keep the three graphs in a folder or tape them together for easier comparison. One set of graphs could be kept as a class (rather than an individual) activity and displayed on the bulletin board. Students should be asked to name (or otherwise label) their graphs.

Total Yards - This will be a bar graph (the weeks are numbered at the middle of each bar). Students will need to round the yardage to the nearest 25 yards

% Completions - This will be a line graph. Points should be plotted on the line indicating the week number. Visual estimation will be needed along vertical axis as each four blocks = 10%.

Average Rushing - This will be a line graph. Again visual estimation will be required along the vertical axis as each four blocks = 0.5 yds. Stress visual estimation rather than using proportions to locate points. (About where should 3.4 yds. go, etc?) The use of pen or colored marker will be more effective than pencil. The dotted lines show the 1985 averages. Total yds. = 343; %QB Completions = 55.8; Avg. Yds. = 4.1. Graphs should be discussed every 2 to 3 weeks. Is there a pattern or trend? How is the season going with respect to last year? Which is stronger, passing or rushing,etc. Headline page could be posted for reference rather than distributed to each student (to minimize amount of duplication.)

FURTHER DISCUSSION / FOLLOW-UP: At the conclusion of the season, find the season averages to compare with 1985. Different students could be assigned different NFL teams and keep their statistics. Graphs could be posted for review and comparison. Students might predict annual averages for the three graphs at the beginning of the season and then be allowed one revision in the middle of the season. Awards could be given for the closest predictions.

Headline: Pats' Stats

Your editor has suggested that keeping a visual record of some of the Patriots' statistics over the sixteen game season may be a good way to see how the team is doing relative to the championship 1985 season. Since it's always a good idea to cooperate with your boss, you agree to keep a graphic record of the total yards per game, the percent of quarterback completions, and the average gain per running play for each week. You will clip the statistics from the paper each week, enter them in chart form, then complete one bar and two line graphs.

You will need to use these facts:

Total Yards = Total Rushing + Total Passing

% Quaterback Completions = $\frac{\text{Number of Passes Completed}}{\text{Number of Passes Attempted}} \times 100$

Rushing Average = $\frac{\text{Number of Yards Gained}}{\text{Number of Rushing Plays}}$

A typical week might look like this:

W or L	W	
	Patriots	Opponents
Score	34	7
Total Yards	429	Bar Graph
QB Completions	69%	Line Graph
Avg. Rushing	4.1	Line Grap
Game #	1	

Patriots, 34-7
at Sullivan Stadium

TEAM STATISTICS.....	Miami	NE
FIRST DOWNS: total...	13	25
Rushing.....	3	11
Passin.....	10	11
Penalties.....	0	3
RUSHING: attempts....	22	41
Net yards gained...	99	167
Passing: net yards...	152	262
Attempted.....	23	26
Completed.....	13	18
Had intercepted....	3	0
Sacked-yards lost..	2-15	1-5
TOTAL OFF.: yds.....	251	429
Plays, pass & rush.	47	68
Avg. gain per play.	4.5	4.1
PUNTING: Number.....	5	4
Average.....	42.6	40.0
Returned-yards.....	3-24	2-12
KICKOFFS: No.-yards..	6-[illegible]6	2-37
PENALTIES-yards.....	8-[illegible]4	4-24
FUMBLES-lost..... ...	[illegible]-0	1-0
Third-down efficiency	3-10	5-12
Possession.....	26:45	33:15

Attendance: 6[illegible],689.

Score by periods

Miami.....	0	0	0	7	-	7
New England	10	17	0	7	-	34

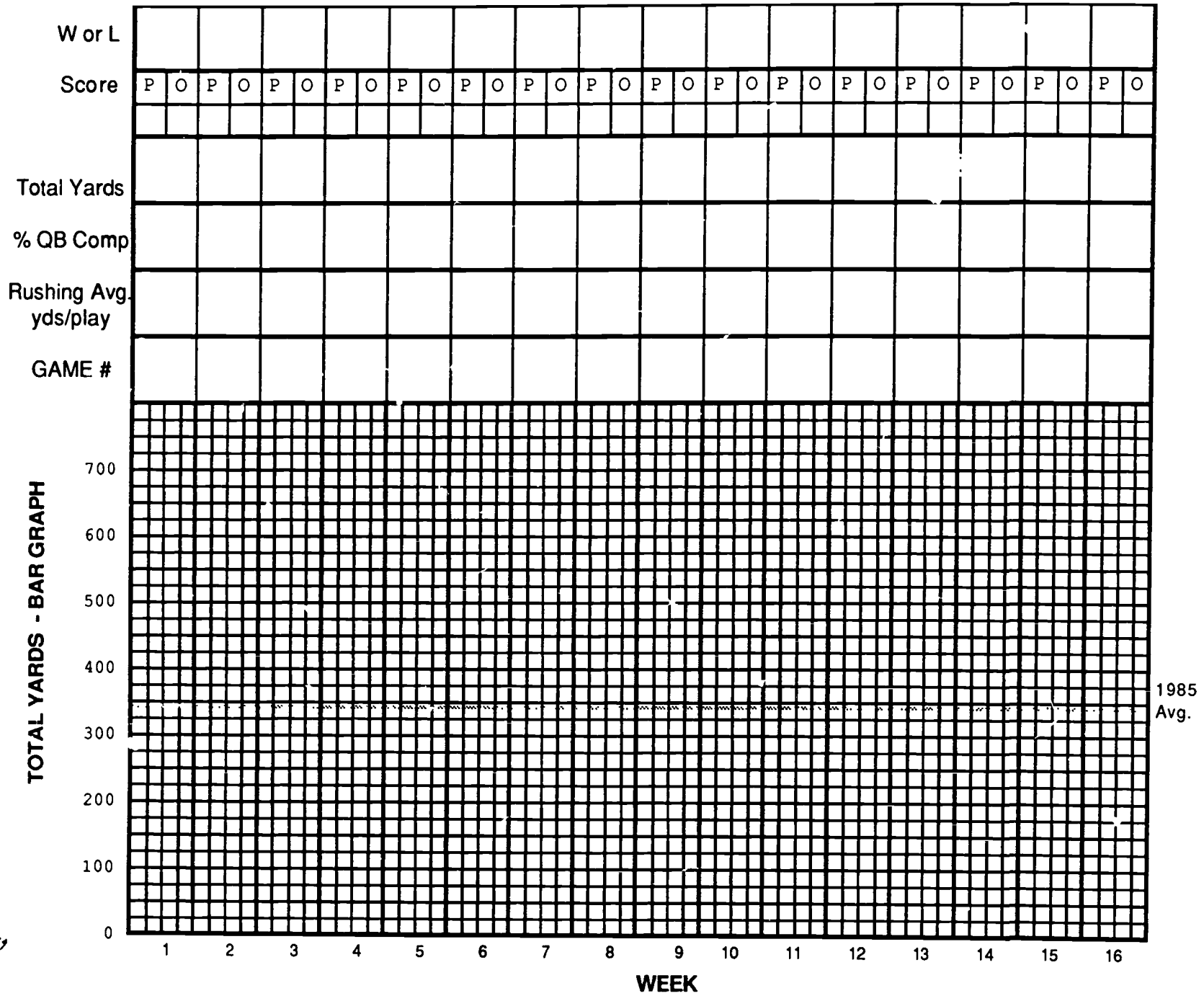
Total Yards
167 + 262 = 429

% QB Completions
18 X100 = 69%
26

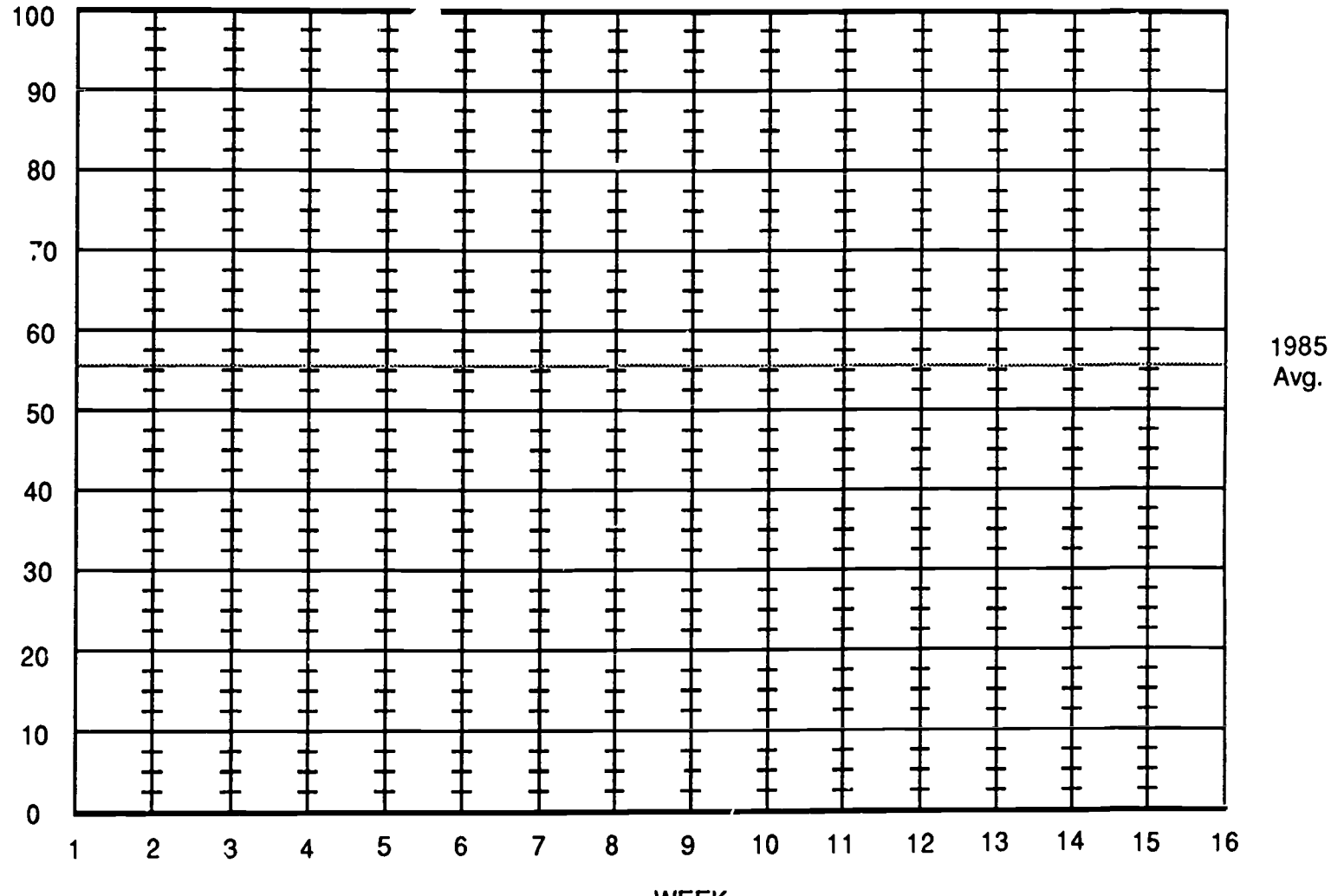
Rushing Average
167 = 4.1
41

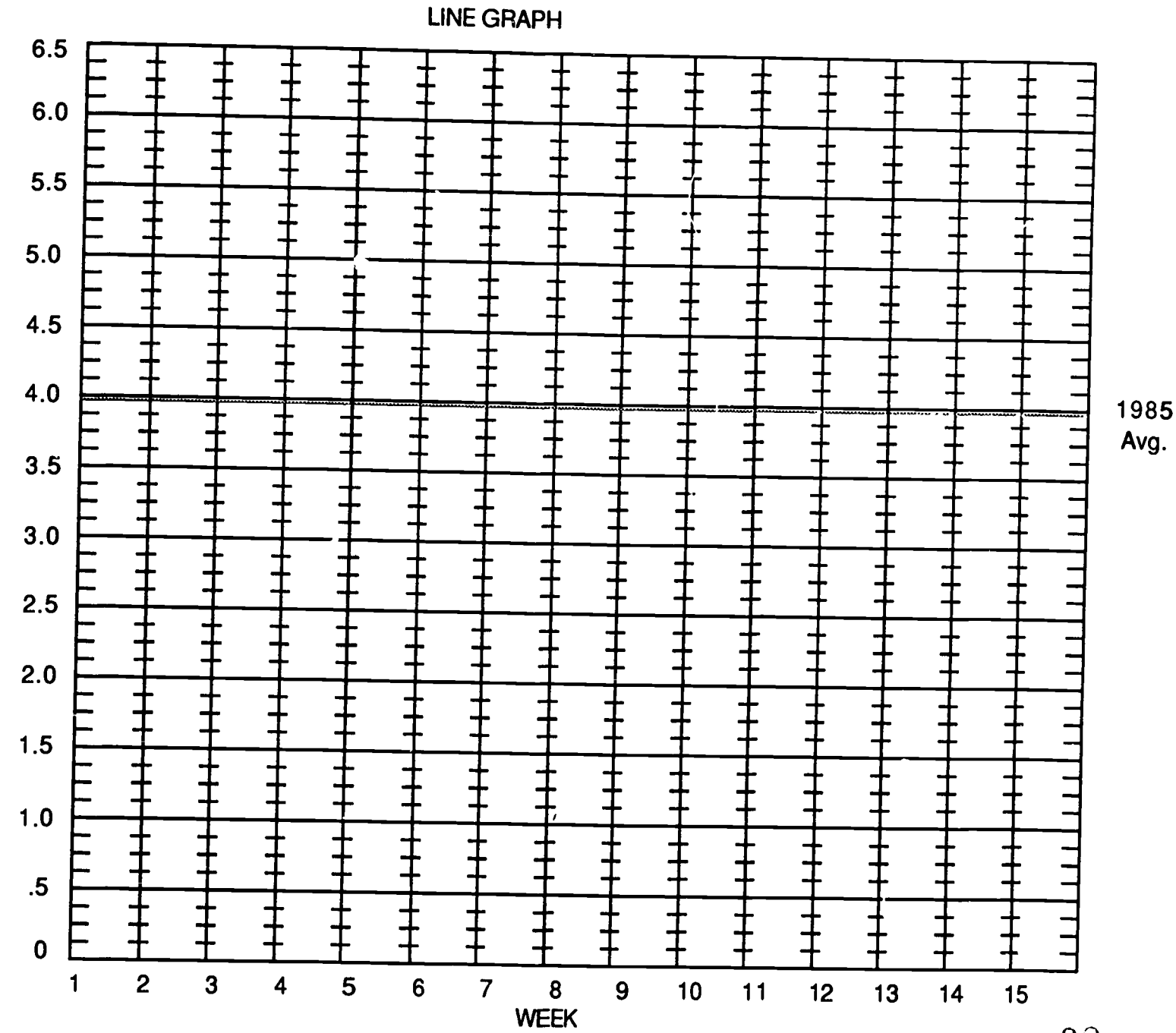
Is the team doing better or worse than in 1985? How do you predict they will finish? What facts back up your prediction? What do you think this year's average will be?

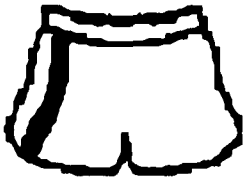
PATS' STATS



LINE GRAPH







EDITOR'S NOTES

TITLE: Do I Need a Calculator? **NATURE OF ACTIVITY:** Problem Solving

OBJECTIVES: To identify important facts in a problem solving situation
To compute with money (+, x)

PRE-SKILLS: Addition, multiplication with whole numbers, rounding with money, multiplication with decimals (nearest tenth)

MATERIALS: Map (optional), calculator (optional)

NOTES: Discuss the facts. Note that only ten of the games are played at home (2 pre-season, 8 regular season). All press conferences will be at the stadium for both regular and pre-season. Students need to understand that 20.5 cents per mile translates to 41 cents per two miles, $2.05 per 10 miles, etc., and that no one could be paid 20.5 cents.

Discuss what different rounding assumptions could be used for money and why. (Always round up, sometimes up. Always round down, sometimes down, etc.)

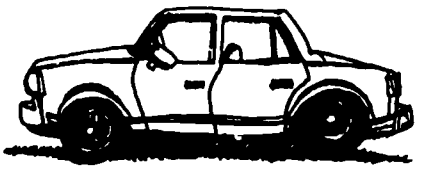
Discuss the different ways to do the totals box. Total all miles, multiply by 20.5 or add individual costs for home games, away games, press conferences, etc.

Students should be expected to give specific reasons for miscellaneous mileage (e.g. special press conferences, playoffs, injuries, trades, etc.).

Discuss miles/round trip as miles per round trip.

FURTHER DISCUSSION / FOLLOW-UP: Discuss why answers could vary for the two methods (total miles X 20.5 or total of indiv. miles X 20.5). Suppose that the reporter is traveling to Sullivan Stadium or Bryant College from your school. Check the mileages and re-do the activity. Vary the activity by changing the facts. Add in one or more playoff games. Increase the mileage allowance, add parking fees (or fines), etc. Use the area map to "relocate" the stadium and/or training camp to another site. Recalculate costs. See May Daze.

Headline: DO I NEED A CALCULATOR?



Your editor has asked you to submit your estimated travel expenses for the Patriots' football season. Away game expenses will come out of another budget so you only need to worry about local activities.

Facts:

4 week training camp at Bryant College (60 miles SW of Boston)
4 week pre-season (2 home games)
16 week regular season (8 home games)
Mon. & Wed. press conferences (regular and preseason)
All games and press conferences are at Sullivan Stadium (35 miles SW of Boston).
Mileage allowance is 20.5 cents per mile. Parking is free for press.
You live in Boston.

Your Obligations:

Attend all home games
Attend all press conferences
Attend three training camp sessions per week

Home Games
10 trips
70 miles / round trip
700 total miles

Press Conferences
40 trips
70 miles / round trip
2800 total miles

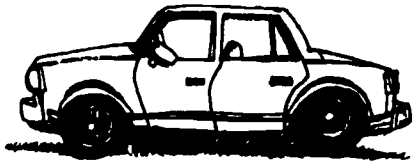
Training Camp
12 trips
120 miles / round trip
1440 total miles

Totals
4940 miles at 20.5¢ / mi
$1012.70 total cost

What special but unexpected events might you need to attend? How much should you plan for "miscellaneous"? Your editor will look closely at this category. Give reasons.

Miscellaneous
_____ trips
_____ miles / round trip
_____ total miles cost

Headline: DO I NEED A CALCULATOR?



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Attend all press conferences
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Home Games
_____ trips
_____ miles / round trip
_____ total miles

Press Conferences
_____ trips
_____ miles / round trip
_____ total miles

Training Camp
_____ trips
_____ miles / round trip
_____ total miles

Totals
_____ miles at 20.5¢ / mi
_____ total cost

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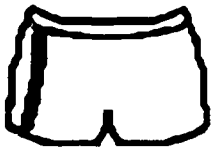
EDITOR'S NOTES



TITLE: It Hurts!!

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To reinforce meaning of percent
To find percent of a number using equivalent fractions
To practice mental arithmetic skills

PRE-SKILLS: Addition & multiplication of whole numbers

MATERIALS: None

NOTES: Teacher may wish to review the meaning of percent as "per hundred". Discuss the use of known facts to determine new information (i.e. build equivalent fractions). Some students may find the fraction form easier to read (3/100 = 6/200 = ?/1000 etc). Students should be encouraged to use alternative methods (e.g. 1200 is 1000+200 or 12 hundreds or 6 two hundreds, etc.) Teacher should avoid converting percents to decimal form and multiplying. Written computation is to be minimized here.

FURTHER DISCUSSION / FOLLOW-UP: Work backwards using smaller bases (20% means 20 per 100, 10 per 50, 5 per 25, 1 per 5, etc.) Have students interview a coach or team doctor and predict percents for injuries to the various parts of the body. Requiring a miscellaneous category will force the total to be 100%. Student predictions can be shown in chart form or on a graph. Students should be expected to give reasons for their predictions orally (class discussion) or in writing.

Headline: IT HURTS !!

The Sunday Supplement will be devoted to sports and health next week. You will need to look at some injury statistics. According to a Stanford survey, approximately 1200 annual NFL injuries in a recent year included: 3% involving the neck, 4.5% the head, 20% the knee, 6% the foot/toe and an assortment of other misfortunes. You believe that readers may understand numbers of injured people better than the percent of injuries, so you must do some computing.

Three percent for neck injuries means -

3 out of every 100
6 out of every 200
__ out of every 500
30 out of every 1000
__ out of every 2000

Since 1200 is 1000 + 200, 3% of 1200 can be found by adding 30 (3% of 1000) and 6 (3% of 200). So, 3% of 1200 means 36 neck injuries.

Four and one-half percent head injuries means -

4.5 per 100
9 per 200
45 per 1000
etc.

Since 1200 is 200 + 1000, 4.5 % of 1200 can be found by adding 9 (4.5% of 200) and 45 (4.5% of 1000)
So, 4.5% of 1200 means 54 head injuries.

* Find the actual injuries (out of 1200).

KNEE: 20% means:

20 out of 100
40 out of 200
200 out of 1000
100 out of 500
400 out of 2000
* 240 out of 1200 * 240 injuries

FOOT/TOE: 6% means:

6 out of 100
12 out of 200
30 out of 500
120 out of 2000
60 out of 1000
* 72 out of 1200 * 72 injuries

SHOULDER: 8.5% means:

8.5 out of 100
17 out of 200
85 out of 1000
51 out of 600
170 out of 2000
102 out of 1200 * _____ injuries

HAND/FINGER: 5% means:

5 out of 100
10 out of 200
20 out of 400
50 out of 1000
30 out of 600
60 out of 1200 * 60 injuries

Think about another sport or activity. Would you predict the same or different injury percentages? Why?

Headline: IT HURTS !!

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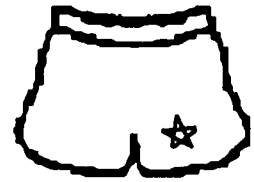
So, 4.5% of 1200 means 54 head injuries.

* Find the actual injuries (out of 1200).

KNEE: 20% means: 20 out of _____ _____ out of 200 _____ out of 1000 _____ out of 500 _____ out of 2000 *____ out of 1200 *_____ injuries	FOOT/TOE: 6% means: 6 out of _____ _____ out of 200 _____ out of 500 _____ out of 2000 _____ out of 1000 *____ out of 1200 *_____ injuries
SHOULDER: 8.5% means: 8.5 out of _____ _____ out of 200 _____ out of 1000 _____ out of 600 _____ out of 2000 _____ out of 1200 *_____ injuries	HAND/FINGER: 5% means: 5 out of _____ _____ out of 200 _____ out of 400 _____ out of 1000 _____ out of 600 _____ out of 1200 *_____ injuries

Think about another sport or activity. Would you predict the same or different injury percentages? Why?

EDITOR'S NOTES



TITLE: What a Way to Start The Day!

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To understand rates as comparisons between measures in different units
To rewrite rates with denominators of one unit
To generate simple picture graphs

PRE-SKILLS: Ability to reduce fractions, ability to sketch fractional parts of concrete objects, knowledge of simple equivalences, i.e., 4 quarts equals 1 gallon, 12 eggs equals one dozen

MATERIALS: Worksheets

NOTES: Students need to know that ratios may involve quotients of measures in the same unit while rates involve measures in different units.

Example: $\frac{12 \text{ min.}}{60 \text{ min.}}$ **ratio** vs. $\frac{60 \text{ miles}}{2 \text{ hour}}$ **rate**

Use quarts rather than gallons for liquid measures (Nutrament is a liquid dietary supplement). Use one pound box sketch for all pound items. Teacher will have to decide how many slices of bread to use for one loaf (16-20 slices).

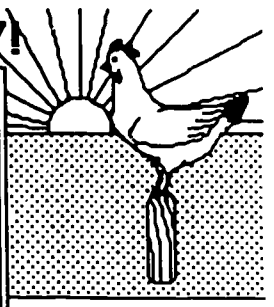
Rates can be rewritten so that the denominator is one unit. Sketching the amounts is intended to focus attention on the size of the number rather than the form for the numeral. Discuss the assumption that each person eats an equal share. Is that reasonable, realistic, etc.? What are some of the factors to be considered? (player vs. coach, personal tastes, size of player, Superbowl vs. regular day, etc.) Have students fold paper vertically to provide blankspace for sketching. They may use pictures at bottom of the page as a guide. Discuss the final picture graph that will result. Not all students will reduce in the same way. Allow for one or more steps (i.e. not all middle columns will look alike).

Sample Row

Bananas	

FURTHER DISCUSSION / FOLLOW-UP: To analyze the final question use a calorie chart and estimate total number of calories represented by the sketch column. If one pound of fat is represented by 3500 calories, how many pounds would this be? Using the item list, have students predict the total amounts for a class breakfast. Then re-do the rest of the chart (or start with amount for one column and work backwards to total amount column). Students can identify the variables (such as class size, male vs. female, age, weight, etc.), then agree on an amount to use and proceed to the picture graphs.

Headline: WHAT A WAY TO START THE DAY!



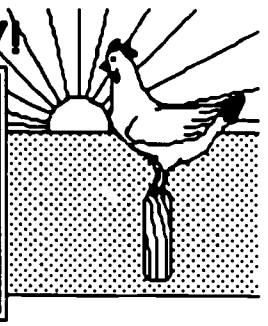
As part of the special Super Bowl supplement you are asked to provide some food information. The dietitian's notes for Super Bowl Day breakfast show the following total amounts, but your readers are always more interested in individual data, so you need to break it down. You will estimate the items eaten by each player to help the readers visualize the total amounts.

Assume there are 60 eaters (45 players, 15 coaches and trainers) and estimate the individual's serving. Assume that all people eat equal shares of each item.

Item	Total Amount	Food per Person Rates	Amount for One
Milk	15 gal. 60 qts.	60 qts. / 60 people = 6 qts. / 6 people = 1 qt. / 1 person	1 qt. / 1 person
Nutrament	10 gal. 40 qts.	40 qts. / 60 people = 4 qts. / 6 people = 2 qts / 3 people	2/3 qt. / 1 person
Cereal	100 boxes	100 boxes / 60 people = 10 boxes / 6 people = 5 boxes / 3 people	1 2/3 boxes / 1 person
Pancakes	600	600 pancakes / 60 people = 60 pancakes / 6 people = 10 pancakes / 1 person	10 pancakes / 1 person
Homefries	50 lbs.	50 lbs. / 60 people = 5 lbs. / 6 people	5/6 lb. / 1 person
Bananas	200	200 bananas / 60 people = 20 bananas / 6 people = 10 bananas / 3 people	3 1/3 bananas / 1 person
Bread	2 loaves 40 slices	40 slices / 60 people = 4 slices / 6 people = 2 slices / 3 people	2/3 slices / 1 person
Orange Juice	18 gal. 72 qts.	72 qts. / 60 people = 12 qts. / 10 people = 6 qts. / 5 people	1 1/5 qts. / 1 person
Melon	35 lbs.	35 lbs. / 60 people = 7 lbs. / 12 people	7/12 lbs. / 1 person
Eggs	35 doz. 420 eggs	420 eggs / 60 people = 42 eggs / 6 people = 7 eggs / 1 person	7 eggs / 1 person
Syrup	4 gal. 16 qts.	16 qts. / 60 people = 4 qts. / 15 people	4/15 qts. / 1 person
Canadian Bacon	40 lbs.	40 lbs. / 60 people = 4 lbs. / 6 people = 2 lbs. / 3 people	2/3 lbs. / 1 person
Honey	6 gal. 24 qts.	24 qts. / 60 people = 4 qts. / 10 people = 2 qts. / 5 people	2/5 qts. / 1 person

Could one person possibly eat this amount? How do you know?

Headline: WHAT A WAY TO START THE DAY!



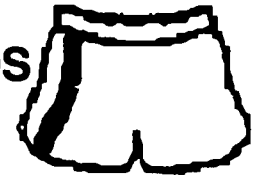
As part of the special Super Bowl supplement you are asked to provide some food information. The dietitian's notes for Super Bowl Day breakfast show the following total amounts, but your readers are always more interested in individual data, so you need to break it down. You will estimate the items eaten by each player to help the readers visualize the total amounts.

Assume there are 60 eaters (45 players, 15 coaches and trainers) and estimate the individual's serving. Assume that all people eat equal shares of each item.

Item	Total Amount	Food per Person Rates	Amount for One
Milk	15 gal. ___qts.		
Nutrament	10 gal. 40 qts.	$\frac{40 \text{ qts.}}{60 \text{ people}} = \frac{4 \text{ qts.}}{6 \text{ people}} = \frac{2 \text{ qts}}{3 \text{ people}}$	$\frac{2/3 \text{ qt.}}{1 \text{ person}}$
Cereal	100 boxes		
Pancakes	600		
Homefries	50 lbs.		$\frac{5/6 \text{ lb.}}{1 \text{ person}}$
Bananas	200	$\frac{200 \text{ bananas}}{60 \text{ people}} = \frac{20 \text{ bananas}}{6 \text{ people}} = \frac{10 \text{ bananas}}{3 \text{ people}}$	$\frac{3\ 1/3 \text{ bananas}}{1 \text{ person}}$
Bread	2 loaves ___slices		
Orange Juice	18 gal. ___qts.		
Melon	35lbs.		
Eggs	35 doz. ___eggs	$\frac{\_\_\_ \text{ eggs}}{60 \text{ people}}$	
Syrup	4 gal. ___qts.		
Canadian Bacon	40 lbs.		
Honey	6 gal. ___qts.		

Could one person possibly eat this amount? How do you know?

Editor's Notes: SCOUTING THE PROS



The New England Patriots

The stats sheets for the Patriots are in both worksheet and grid form. The students are to watch a football game on TV for homework or on videotape as a class activity. While watching the game, they are to use the tally sheets or grids* to record the statistics of the appropriate activities.

After students have completed their stat sheets, they can write a comprehensive article on the game watched, incorporating the statistics gathered.

Quarterback Stats

Students can use either the tally sheet or the grid. When using the tally sheet, students are to make slash marks for the number of attempted passes and the number of completed passes during each quarter.

If preferred, students may use the grid to record the information (a separate grid for each quarter). They should follow the key at the top of the page to help them record the information.

After the results have been gathered, the information should be totalled on the bottom of the tally sheet. The Pass Completion Average for that player can be computed and analyzed.

Offensive Plays

Students are to keep track of running plays versus passing plays. To do this on the tally sheet, they are to mark an R or P in the appropriate box. They are to keep track of the number of yards gained or lost on each play. They can do this by placing the number in the appropriate box. A quarterback sack should be counted as a running play because no pass was thrown.

If preferred, students may use the grid (one for each quarter) to record the information.

Once the information has been gathered, students should transfer their results on to the bottom of the tally sheet and compute the ratio of running versus passing plays and ratio of yards gained and lost.

Note: If time is limited, students could watch just one period, one half, or a specified time such as 15 minutes, 30 minutes, etc.

*When using the grid, remind students to place their symbols in the same area where the play took place.

Patriots Statistics Tally Sheet

Opposing Team: _____ Date: _____

Quarterback Statistics for: _____

Quarter	Number of Passes Attempted	Number of Passes Completed
First		
Second		
Third		
Fourth		

	Attempts	Completions
First Quarter	_____	_____
Second Quarter	_____	_____
Third Quarter	_____	_____
Fourth Quarter	_____	_____
Total	_____	_____

Pass Completion Average _____

$$\text{PCT.} = \frac{\text{Completions}}{\text{Attempts}} \times 100 \text{ (nearest tenth)}$$

Patriots Statistics Tally Sheet

Opposing Team: _____ Date: _____

Statistics for Offensive Plays:

Quarter	Running or Passing Plays (R or P)	Number of Yards Gained	Number of Yards Lost
First			
Second			
Third			
Fourth			

	Running Plays	Passing Plays	Yards Gained	Yards Lost
First Quarter	_____	_____	_____	_____
Second Quarter	_____	_____	_____	_____
Third Quarter	_____	_____	_____	_____
Fourth Quarter	_____	_____	_____	_____
Total	_____	_____	_____	_____

Ratio of Running to Passing Plays _____

Ratio of Yards Gained to Yards Lost _____

QUARTERBACK STATS

Player Name _____ Number _____

P = pass Ⓟ = pass completed

G	___	___	G
10	___	___	10
20	___	___	20
30	___	___	30
40	___	___	40
50	___	___	50
40	___	___	40
30	___	___	30
20	___	___	20
10	___	___	10
G	___	___	G

OFFENSIVE PLAYS

Quarter _____

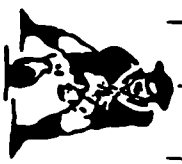
R = running play

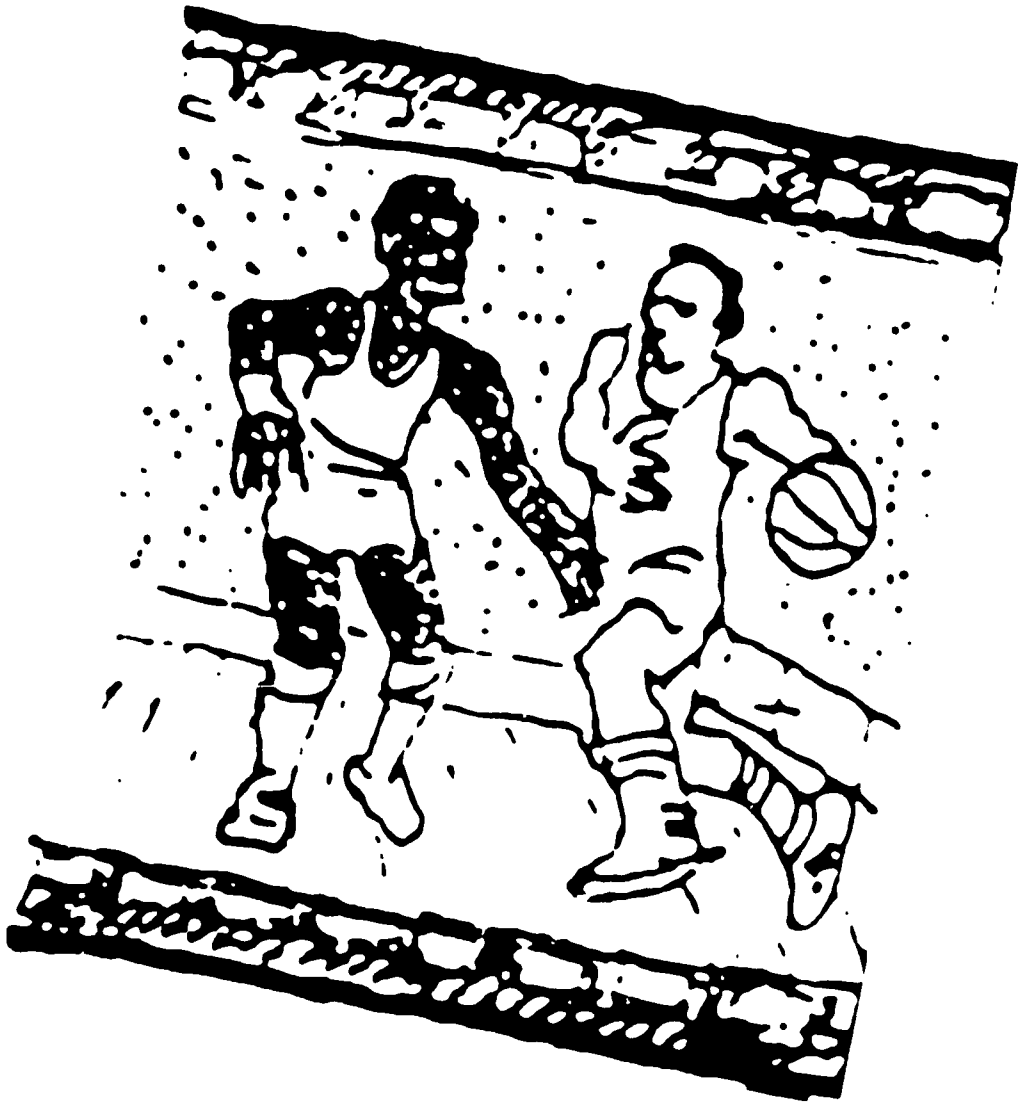
P = passing play

+ = yards gained

− = yards lost

G			G
10	___	___	10
20	___	___	20
30	___	___	30
40	___	___	40
50	___	___	50
40	___	___	40
30	___	___	30
20	___	___	20
10	___	___	10
G	___	___	G





Basketball - Boston Garden

Boston Garden Information

Built in 1928 for $10,000,000

Used primarily for basketball, hockey, wrestling, and ice shows

Dimensions of the building are 500 ft. x 242 ft. x 85 ft.

The Garden is too small to be effectively used for indoor track or soccer

There are roughly 250 events a year including a weekly church service

Seating capacities:		
	basketball	14,890
	hockey	14,482 (see breakdown below)
	boxing/wrestling	15,909
	ice show	11,000

There are 37 sky boxes, each with 12 seats

There are approximately 1000 obstructed seats

Types and number of seats for hockey:

Promenade	1013	Stadium	4258
Loge	3245	Sky Box	444
Balcony	5288	Balcony Loge	234

Celtics had 38 regular season games, all sellouts at 14,890. (Attendance figures are based on sold and complimentary tickets, not on people who show up)

Disney shows drew a total attendance of 166,000 for 24 shows.

Hockey rink is 83 ft. x 191 ft.

Famous parquet floor (for basketball) has 264 sections, each 5 ft. x 5 ft.

Changeover time from hockey to basketball or from basketball to hockey is between 2 hours and 2 hours 10 minutes.

Hockey dasher boards are 4 feet high, side glass is 5 feet above the boards, end glass is 14 feet above the boards.

Bruins locker room is 60 ft. x 28 ft. on 2 levels; individual lockers are 2 1/2 ft. x ? ft. x 6 ft.

54 banners hang from the rafters as of October 1986. They include banner for Celtics & Bruins Championships, Bruins Division Titles, and Retired numbers of exceptional players.

EDITOR'S NOTES

TITLE: What's the Problem at Boston Garden?

NATURE OF ACTIVITY: Problem posing

OBJECTIVES: To formulate word problems
To identify relevant data in a problem solving situation
To choose appropriate problem solving strategies

PRE-SKILLS: Some problem solving experience

MATERIALS: Fact sheets (see Press Kit), brochures, flyers, etc. about facility (optional)

NOTES: This activity requires students to focus on the facts in a problem situation as well as on the question and solution. Discuss fact sources other than those in the teacher packet (Press Kit). Students may be able to bring in program books, brochures, etc. or have information from personal trips, T.V. viewing, etc. To start the thinking process, choose one or two pieces of data and have students brainstorm to produce possible questions. Focus on fluency first, then select those questions that can be solved with the students' background in mathematics. Discuss the kinds of questions that could be asked: How many? How much more? What fraction? What percent? How many ways?, What's the least?, etc.

Encourage questions that require varied strategies such as single computation, multiple computations, sketching, efficient counting, chart or list, etc. Plain paper may be used so the number of problems is not limited to five. Students may fold over the solution column so that problems can be posted or exchanged for sharing.

SAMPLE

FACTS	QUESTION(S)	SOLUTION
There are 14,482 hockey seats at Boston Garden. There are 444 Sky Box seats.	What percent of the seats for hockey are Sky Box seats?	444 ÷ 14,482 = .03 3% are Sky Box seats.

FURTHER DISCUSSION / FOLLOW-UP: Put some constraints on the kinds of questions that can be used. For example:

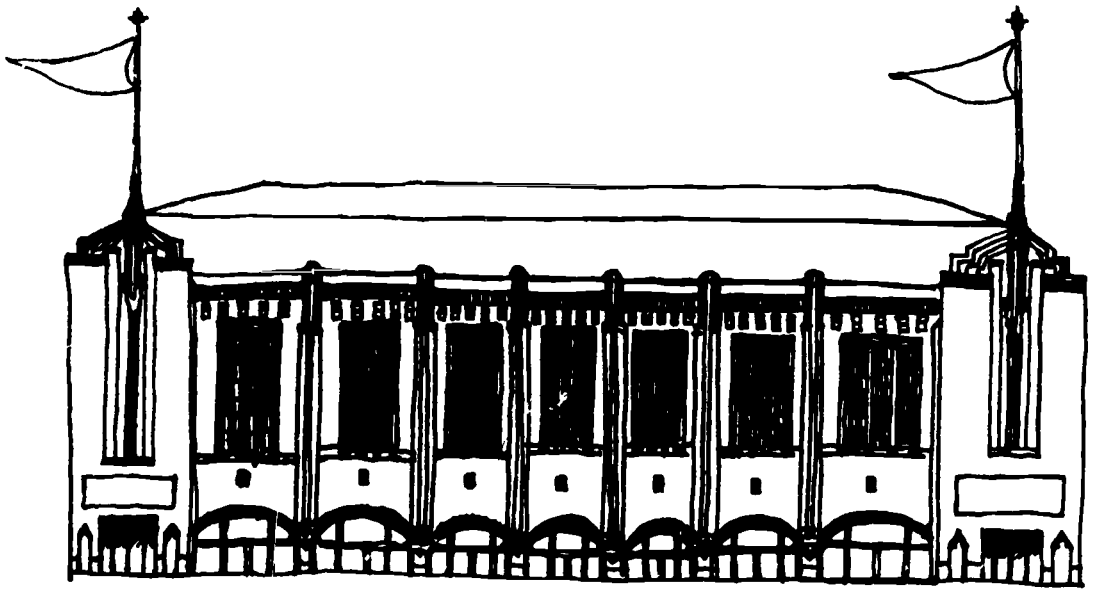
Must involve more than one operation for solution.
Must involve a particular operation(s).
Must involve a percent or decimal.
Must have extraneous data among facts.

This can be used as a bulletin board activity where the teacher posts one or more facts on a regular basis and students contribute questions (and solutions). Plan a fact or data gathering field trip to Boston Garden. The problems generated could be put on 3x5 cards (with answers on the back) to become a problem solving deck. See other What's the Problem at _____ activities.

Headline: WHAT'S THE PROBLEM AT BOSTON GARDEN?

The Harvard Regional Math Network has asked your editor to suggest some problem solving activities that are related to sports. Guess who was assigned this challenge! You must use your resource file (as well as your memory) for facts to make up some sample problems that other students might enjoy. Record your problems in your reporter's notebook using the following headings:

FACTS	QUESTION(S)	SOLUTION(S)



EDITOR'S NOTES

TITLE: How Hot Is Your Shot? **NATURE OF ACTIVITY:** Simulation

OBJECTIVE: To generate ratios from experience
To change ratios from fraction to decimal form
To compare percents

PRE-SKILLS: Ability to convert ratios from fraction to decimal then to percent form

MATERIALS: Wastebaskets (paper shopping bags as an alternative)

NOTES: Teacher should decide on an appropriate distance (8' is suggested for small baskets or bags, 10' for large barrels.) Determine an appropriate number of trials per person depending on ability of students.

(a) Allow all students the same number of trials; trials will result in easy conversions to decimals and percent, or
(b) Use different numbers of trials by allowing students to draw slips specifying their number of shots (e.g. 2,5,10,4,8)

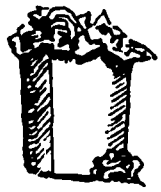
Stress conversions without using division wherever possible. Use 8 1/2 x 11" paper for "ball".

$$\frac{7}{10} = \frac{70}{100} = 70\% \qquad \frac{3}{4} = \frac{75}{100} = 75\%$$

Have each team record individual results only (use page 1) or keep stats for the entire class (use both pages). Shooting can be done in small groups working simultaneously or one team at a time with class recording.

FURTHER DISCUSSION / FOLLOW-UP:
Get stats for pros and compare with student averages.
What are variables?
distance, size of paper, amount of practice, ability or prior shooting experience, backboard, height of basket
Award prizes for team / individual efforts
Repeat experience (once using simple denominators, once using harder)
Discuss what a free throw average in percent form doesn't tell. e.g. 64% average could mean 64 out of 100, 32 out of 50, 16 out of 25, 128 out of 200 etc.
See Who's The Best activity

Headline: How Hot is Your Shot?



Imagine! You've been invited to be the guest lecturer for a math class just starting a unit on percent. The teacher expects you to show how math relates to sports, and the kids expect you to do something that is fun. What a challenge! Here are the instructions you will give for an activity that will make both the teacher and the students happy.

In basketball, free throw averages are based upon the number of successful shots from the foul line. You will work in teams to compute your averages and then the team average. You must obey these rules:

1) Stand ☐ away and toss a crumpled paper (the basketball) into the wastebasket (the hoop).

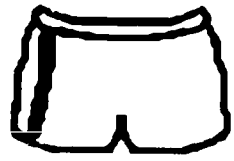
2) Record the results for each player using the number of trials ☐ your teacher specifies.

3) Complete the chart to find each individual's average and then the team average.

4) Choose an interesting first name for yourself and decide on a name for your team.

Team Name	No. of Shots	No. of Baskets	Free Throw Averages		
			Ratio	Decimal	%
Team Totals					

How hot is your shot? What's a good free throw average (for students, college players, pros, etc.)? What do the averages really tell? What don't they tell?



EDITOR'S NOTES

TITLE: Who's the Best? **NATURE OF ACTIVITY:** Worksheet

OBJECTIVES: To compare and order decimal numbers
To build equivalent fractions starting with decimal numbers

PRE-SKILLS: Comparing whole numbers, reading decimals to thousandths, understanding equivalent fractions

MATERIALS: None

NOTES: The definition of Field Goal Percentage as (baskets ÷ attempts) requires a new understanding of the term percentage. Students may be able to suggest other areas (especially in sports) where percentage is used "differently". Common usages are often different from textbook definitions, and students should learn flexibility in thinking. Students need to understand that 2768 ÷ 4984 is approximately equivalent to 555 ÷ 1000, 1110 ÷ 2000, etc. What unusual FGP figures are likely to occur? (Is 1.000 possible, 0.000, etc?) When are such figures likely or possible? Discuss what the FGP doesn't tell (the number of baskets, the number of attempts) as well as what it does tell.

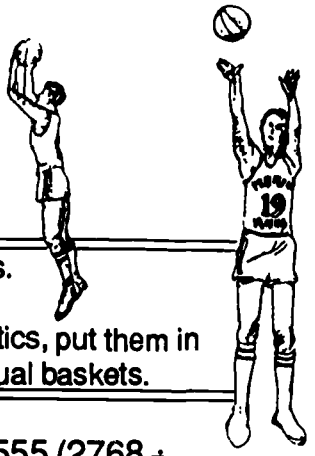
FURTHER DISCUSSION / FOLLOW-UP: Since the stats are lifetime ones, it may be fun to predict which of the many equivalent ratios is the "real" one. How many basket attempts are reasonable for one game, one season, a lifetime, etc. Have students compute the average FGP for this group of ten players and then use it to estimate what their own averages might be.

This is a good exercise in working with large numbers. Students can bring in newspaper/program statistics to compare, order, interpret, etc. Discuss how lifetime stats may be different from single game or single season stats. What factors are involved? (injuries, "hot streaks", playing time, etc;)

Discuss the likely difference between free throw averages & field goal percentages. What are some reasons for differences?

See: How Hot Is Your Shot?, How Embarrassing, What's the Percentage?, Stats State It

Headline: Who's the Best?



Editors are always pushing for comparisons between players.
(They say it makes for better headlines.)
You've been asked to take a look at some typical basketball program statistics, put them in order for other writers to use, and try to relate percentage figures to actual baskets.

Cedric Maxwell's 2768 baskets out of 4984 attempts give a FGP of .555 (2768 ÷ 4984). Robert Parish made 3127 out of 5682 for a FGP of .550 (3127 ÷ 5682). FGP figures are usually written as decimals rounded to the nearest thousandth.

FGP

What Does It Say?

Order the following Celtics (past or present) from highest FGP (#1) to lowest FGP (#10)

Order

4 Rick Robey---------- .510

6 Geraid Henderson----------.489

8 Don Nelson---------- .484

10 Nate Archibald---------- .469

1 Cedric Maxwell---------- .555

3 Kevin McHale---------- .548

5 Larry Bird---------- .496

9 Bailey Howell---------- .480

7 Danny Ainge----------.486

2 Robert Parish---------- .550

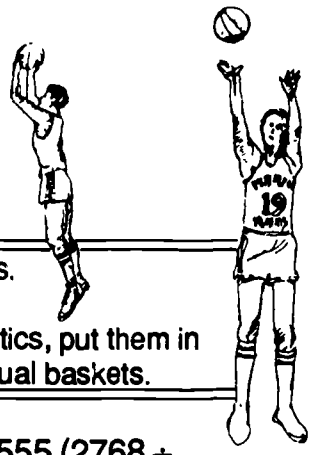
What Does It Mean?

Use the FGP to tell the possible number of baskets with these attempts:

out of 1000	out of 2000	out of 6000 attempts
510	1020	3060
	978	2934
484	968	2904
	938	2814
555	1110	3330
548	1096	3288
496		2976
480	960	2880
	972	2916
550		3300

If these are lifetime statistics as of 1985, who is <u>really</u> the best? Does the largest FGP mean the most baskets? What is a typical FGP for professional players?

Headline: Who's the Best?



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	1020	
555		

If these are lifetime statistics as of 1985, who is really the best? Does the largest FGP mean the most baskets? What is a typical FGP for professional players?

EDITOR'S NOTES

TITLE: What's the Percentage? **NATURE OF ACTIVITY:** Worksheet, Calculator Activity

OBJECTIVES: To compute field goal percentages to thousandths
To compare decimal numbers
To order decimals in decreasing order

PRE-SKILLS: Division of whole numbers resulting in a decimal, rounding decimals to thousandths, comparing decimals

MATERIALS: Calculator

NOTES: A discussion of the players named and the teams they played for may enhance student motivation and interest for this activity. It is also important to discuss that FGP is always written in thousandths even though we normally think of percentage as being part of one hundred.

Bill Cartwright, NY Knicks
Kareem Abdul-Jabbar, LA Lakers
Artis Gilmore, Chicago Bulls/ San Antonio Spurs
Darryl Dawkins, Philadelphia 76ers/NJ Nets
Michael Jordan, Chicago Bulls
Kevin McHale, Boston Celtics
Larry Bird, Boston Celtics
Buck Williams, NJ Nets
Adrian Dantley, Utah Jazz / Detroit Pistons
Magic Johnson, LA Lakers

Have students rank the players according to number of field goals and compare this with the FGA ranking. Discuss how comparison by absolute number is different from comparison by percent. Students should be instructed that ties (to nearest thousandth) should be carried to another place.

FGA - field goals attempted FGM - field goals made

FURTHER DISCUSSION / FOLLOW-UP: Students may enjoy generating their own data and FGP figures with a trip to the gym and a short game. Using recent statistics from a particular professional game, students can compute FGP for particular players. Discuss how career averages and single game averages differ. Estimating points scored from FGM requires an estimate for two point vs. three point baskets. See Celtics Box Scores, How Hot Is Your Shot, Who's the Best?

HEADLINE: What's the Percentage?

Your next column will require some comparisons of basketball shooting ability. You will need to use your calculator to compute the Field Goal Percentage for each of these NBA stars, rounding to three decimal places (thousandths). After you have computed their percentages, you will put them in order, beginning with the highest (#1).

Before you start, it might be interesting to try guessing the ranking of percentages from best to worst. Number your choices to the left of each name (best is # 1).

FIELD GOAL PERCENTAGES (FGP)

Ranking Guess	Ranking Actual	Player	FGM Field Goals Made	FGA Field Goals Attempted	(FGM ÷ FGA) = FGP
___	5	Bill Cartwright	2583	4639	2583 ÷ 4639 = .557
___	4	Kareem Abdul-Jabbbar	13729	24414	13729 ÷ 24414 = .562
___	1	Artis Gilmore	4864	8125	4864 ÷ 8125 = .599
___	5	Buck Williams	2121	3808	2121 ÷ 3808 = .557
___	2	Darryl Dawkins	3162	5578	3162 ÷ 5578 = .567
___	9	Michael Jordan	987	1953	987 ÷ 1953 = .505
___	8	Kevin McHale	2459	4551	2459 ÷ 4551 = .540
___	10	Larry Bird	5342	10769	5342 ÷ 10769 = .496
___	3	Magic Johnson	2927	5184	2927 ÷ 5184 = .565
___	7	Adrian Dantley	5586	10191	5586 ÷ 10191 = .548

Is the player who has made the most field goals also the player with the best field goal percentage (the least, the worst percentage)? Can you tell how many points each has scored? What else do you need to know to answer that question?

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—	—	Larry Bird	5342	10769	_____
—	—	Magic Johnson	2927	5184	_____
—	—	Adrian Dantley	5586	10191	_____

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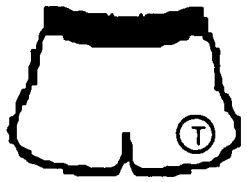
EDITOR'S NOTES



TITLE: Wow, What A Player!
The Stats State It.

NATURE OF ACTIVITY: Template Worksheets (2)

OBJECTIVES: To locate data in a chart or table
To convert ratios to decimal form

PRE-SKILLS: Division of one and two-digit numbers by a two-digit number, rounding quotients

MATERIALS: Calculator (optional), basketball box scores from newspaper

NOTES: This is a template activity requiring recent data from the newspaper. The Celtics Box scores are found in the sports section after each game and can be used to create a variety of activities. The teacher can mimeograph the box scores as such (see attached sample). Options for these activities include the following decimals:

1. Shots made by each player	FGM÷A
2. Free throws made by each player	FTM÷A
3. Total points by each player	Pts÷Total Pts
4. Total rebounds by each player	Reb Tot÷Team Reb Tot
5. Minutes played by each player	Min ÷ 48

Students must write the ratios from the chart and then convert to decimal or percent form. A calculator may be used at the discretion of the teacher. Note that the length of the game is 48 minutes (the 240 minutes represents 5 players x 48 minutes). Stress the easier comparison with decimals or percent rather than fraction form. Have students use a 3-place decimal for field goals and free throw stats and a percent (nearest tenth) for points, rebounds, and minutes. Teacher should discuss the frequent sports use of the word percentage to refer to a three place decimal. Sports usage may conflict with textbook definitions and students should be flexible about the arbitrary nature of definitions.

Wow, What A Player! - Assign (lottery, student choice, etc) one player to each student. Use the box score information to complete the first three columns of the chart. Convert ratios to decimal form in fourth column. Students might enjoy comparing results with classmates.

The Stats State It - Choose two of the five categories listed above. Students must complete the player and ratio portions of the chart using the box scores information. They may focus on either the Celtics or the opposing team. They must convert ratios to percentages by dividing or by using the calculator.

FURTHER DISCUSSION / FOLLOW-UP: Use the same charts to profile local (school or college) games for analysis. As an ongoing activity, have student(s) keep game stats for each game of the season (playoff season) to post and discuss figures periodically. Assign each student one player and one or more statistical categories. Have students graph the percentages computed and discuss the change over the course of the season. See How Hot Is Your Shot?, Hot Sox, Pats' Stats, What A Day!

Below is a sample of the statistics for a Boston Celtics game. Such stats appear in the paper after every game.

Celtics, 123-105

at Boston Garden

UTAH

	Min	FG M-A	FT M-A	Reb O-T	A	F	Pts
Tripucka	12	0-5	0-0	0-1	1	3	0
Malone	30	8-19	4-5	5-6	1	4	20
Eaton	15	2-3	1-1	2-4	1	3	5
Green	24	6-11	0-1	0-2	6	0	12
Griffith	28	7-14	0-0	1-1	1	1	14
Stockton	24	2-5	0-0	0-1	10	1	5
Bailey	22	4-10	2-2	2-5	2	4	10
Benson	33	6-13	0-0	4-13	0	5	12
Curry	20	4-9	4-4	1-3	3	3	12
Iavaroni	18	5-6	0-0	1-3	1	5	10
Scurry	14	2-7	1-2	2-2	2	2	5
Totals	240	46-102	12-15	18-41	28	31	105

FG% .451, FT% .800; Three-pt goals: 1-6, .167 (Stockton 1-1, Tripucka 0-1, Green 0-1, Curry 0-1, Griffith 0-2). Team Rebounds: 7. Blocked: 7 (Eaton 2, Malone 2, Benson, Curry, Scurry). Turnovers: 12 (Bailey 4, Iavaroni 3, Tripucka, Green, Griffith, Stockton, Curry). Steals: 8 (Scurry 3, Malone 2, Green, Eaton, Curry). Technical foul: Tripucka, 3:14 2d. Illegal defense: 1.

BOSTON

	Min	FG M-A	FT M-A	Reb O-T	A	F	Pts
McHale	31	12-15	9-10	1-7	2	2	33
Bird	32	10-15	6-7	1-8	13	1	27
Parish	34	7-9	7-7	1-5	0	2	21
Johnson	30	5-10	0-0	0-3	9	1	10
Ainge	27	4-7	0-0	2-5	3	4	8
Sichting	19	1-4	0-0	0-1	1	1	2
Kite	17	0-2	2-4	2-6	2	3	2
Roberts	16	2-3	3-4	1-2	1	1	7
Carlisle	15	0-3	3-4	0-2	2	2	3
Daye	5	0-4	0-2	1-3	0	0	0
Henry	9	1-4	2-2	0-0	1	1	4
Vincent	5	2-3	2-2	0-1	0	1	6
Totals	240	44-79	34-42	9-43	34	19	123

FG% .557, FT% .809; Three-pt goals: 1-6, .167 (Bird 1-3, Sichting 0-1, Carlisle 0-1, Henry 0-1). Team Rebounds: 11; Blocked: 6 (Parish 4, McHale, Kite). Turnovers: 16 (Carlisle 4, Bird 3, McHale 2, Ainge 2, Daye 2, Johnson, Henry, Parish). Steals: 9 (Parish 2, Ainge 2, Carlisle 2, Johnson, Bird, Kite). Technical fouls: None. Illegal defense: None.

Utah	30	20	22	33	— 105
BOSTON	33	37	31	22	— 123

A—16,890; T—2:03; Officials—Bill Sear, Blaine Reichelt.

Abbreviations

Min - Minutes of playing time (48 for pro game)

FG - Field Goals
M - baskets made A - shots attempted

FT - Free throws
M- baskets made A - shots attempted

Reb - Rebounds
O - offensive T - total

A - Assists

F - Fouls

Pts - Total points scored per player

Headline: WOW, WHAT A PLAYER!

Because _____ had such an awesome/awful game last night, your editor wants you to do an in-depth profile of him and his stats. It's easier to read statistical information in the form of a chart, so you'll fill in the chart below to aid in writing your article.

	Attempts A	Baskets M	Ratio	Decimal
Field Goals FG				.____
Free Throws FT				___.__%

	Individual Total	Team Total	Ratio	Decimal
Points				___.__%

	Individual Total	Team Total	Ratio	Decimal
Rebounds				___.__%

	Individual Minutes	Length of Game	Ratio	Decimal
Playing Time				___.__%

If your story were to begin, "_____ was awesome / awful last night
player
because....", what facts would you give as evidence?

HEADLINE: The Stats State It

Your editor has decided that you should do an analysis on today's box score.Using the data, you're going to concentrate on two of these areas: field goals, free throws, total points, rebounds, minutes played. The two you choose are : _____ and _____.

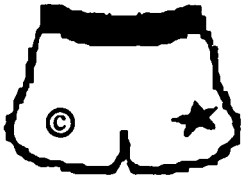
You will need to complete the chart below to use as the basis for your analysis.

area analyzed

Player	Ratio	Percentage	Ratio	Percentage

Is it easier to analyze the stats in ratio or percentage form? Why? Could you predict anything about the game with just this data? Using your chart, give three descriptive phrases: (The best rebounder was ...., the worst free throw shooter was.....)

EDITOR'S NOTES



TITLE: The World Wrestling Federation Comes to Boston Garden

NATURE OF ACTIVITY: Simulation

OBJECTIVES: To use percent of increase
To use data in a problem solving situation
To use computational skills in a practical situation

PRE-SKILLS: Multiplication with decimals, finding the percent of a number, rounding with money

MATERIALS: Colored pencils or crayons, calculator

NOTES: This is a multi-step activity requiring more than one lesson. Student choice is required and hence answers will vary. Students are to use their own discretion in determining seating arrangements and prices. Although they may need some direction; they are to do it independently. There should be some discussion about how seating prices and increases are determined. The seating chart has some defined sections for the five price categories, but students may choose to ignore these and use their own creativity. Efficient counting techniques should be discussed and encouraged. Calculators should be used here as computational drill is not a major objective, but mental calculation of 15% & 20% increases is encouraged.

This is a good time to review terms like income, revenue, unit price, profit, etc. Discuss how realistic the concession sales figures are with respect to anticipated attendance. Does everyone eat one of each thing, more than one, etc? Students may use '86 revenues or make their own projections, but they should be able to give reasons.

FURTHER DISCUSSION / FOLLOW-UP: Students can discuss their own experience with ticket prices. Perhaps students could bring in their own ticket stubs and compare them with a seating outline of the local sports center. Have students bring in clippings about actual wrestling competitions. How do ticket prices, attendance, etc. compare? Research advertising costs of T.V., radio, newspaper, etc. How many minutes, inches of space, etc. could be purchased with the amount they have allotted?

Headline: The World Wrestling Federation Comes To Boston Garden

You have offered to assist the Program Director at the Boston Garden with plans for a wrestling championship. Your responsibilities include seating, advertising, and concessions. Fortunately, you've been given some data to get you started

Seating: In the outline of the Garden, each box seats 16 people. The ticket prices for last year were $5.00, $8.00, $10.00, and $12.00. You are going to add a new category of ringside seats. You must decide how many seats to plan for this section (leave room for press, judges, etc.) and how much to charge. Color the model and complete the first two columns of the chart.

Seat Category	Color	Number	15% Increase	'86 Price	Income
$5.00					
$8.00					
$10.00					
$12.00					
Ringside:					
Total:					

Since wrestling has become so popular, the director predicts a sell out! The sponsors are anxious to know how much will be made in ticket sales if they increase the prices by 15%. Compute the increases, new prices, and find the income to complete the chart.

Expenses for W.W.F.
You plan to spend 12% of the ticket income on advertising. This is how much money? _____. You must decide what part of the 12% will be spent for TV advertising and what part for print advertising.

_____% T.V.+_____% Print = 12% Total

Advertising	%	Amount of Money
T.V.		
Media		
Total	12%	

Concession Items For W.W.F. How could the program director explain the 15% price increase? What are some reasons he could give to justify it? Can you work backwards to find what last year's total income was?

Item	'85 Price	# Sold	'85 Revenue	'86 Price	Projected Revenue
Hot Dogs	$1.05	15,705			
Pizza	$1.05	12,050			
Popcorn	$ .85	16,700			
Pretzels	$ .75	10,825			
Ice Cream	$ .80	23,000			
Pepsi	$ .65	27,560			
Total					

The sponsors want to raise food prices by 20%. (They have agreed to round to the nearest nickel to avoid pennies.) Find the '86 revenue, new '87 prices (rounded), and projected '87 revenue.

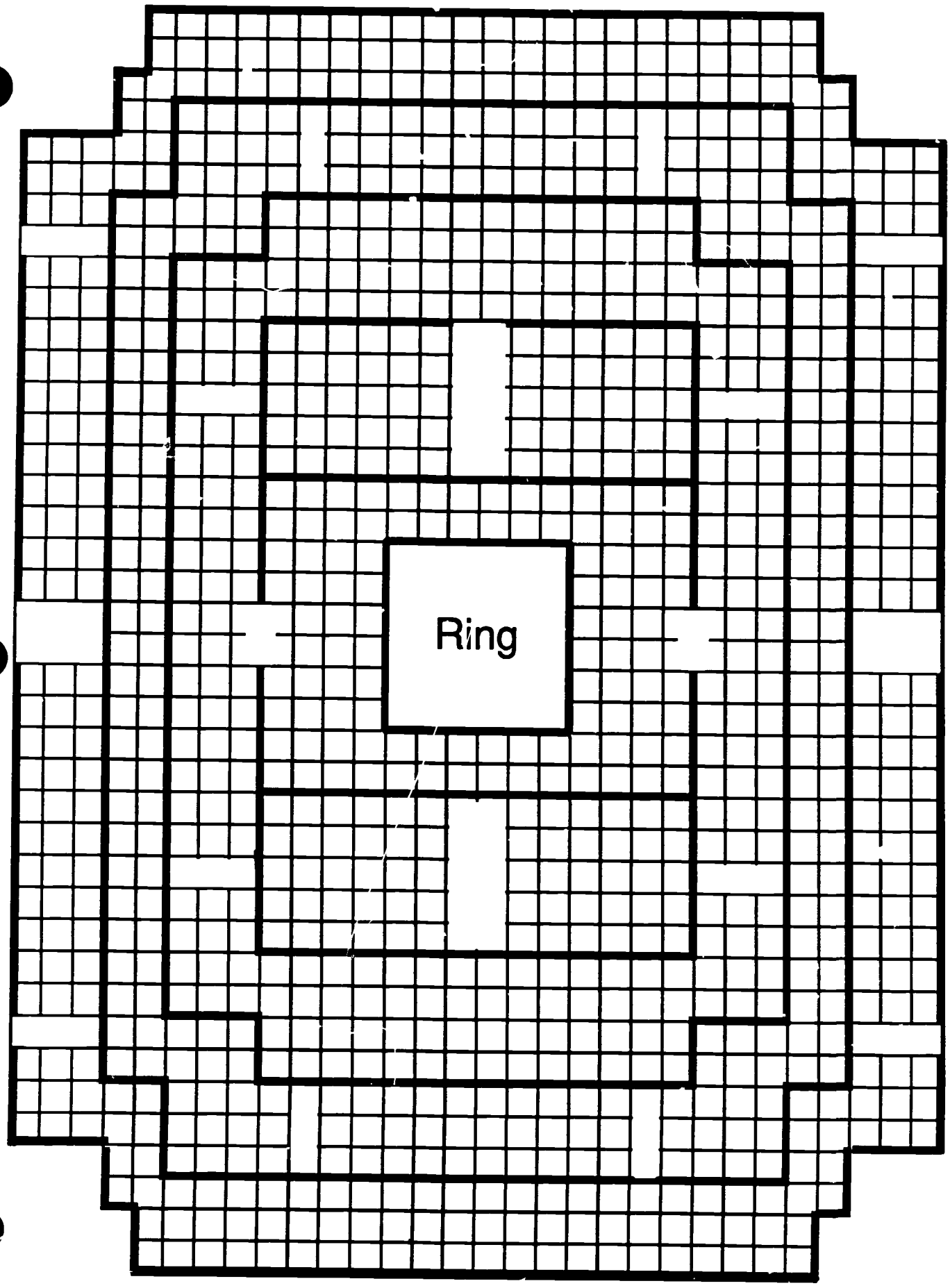
When you order food for a concessions stand, it comes in the following packages:

Hot Dog Rolls - Packages of 12 @ 1.75
Hot Dogs - Packages of 50 @ 8.50
Popcorn Kernels - Bags of 25 lbs. (yields 1,000 cups) @ $15.00
Popcorn Cups - Boxes of 500 @ $7.25
Pretzels - Boxes of 50 @ $6.30
Ice Cream - Packages of 12 @ $4.60
Pepsi Tanks - Tanks (yielding 500 cups) @ $37.20
Pepsi Cups - Boxes of 1,000 @ $20.00

You must order enough for the projected sales.

item	projected sales	order	unit price	total price
Hot Dog Rolls		pkg		
Hot Dogs		pkg		
Popcorn Kernels		bags		
Popcorn Cups		boxes		
Pretzels		boxes		
Ice Cream		pkg		
Pepsi		tanks		
Pepsi Cups		boxes		
			Total =	

What could cause your projected ticket and food revenues to be wrong?
Why might the actual sales be greater?
What could cause them to be smaller?


Ring

EDITOR'S NOTES

TITLE: The Reporters' Contest **NATURE OF ACTIVITY:** Design Project

OBJECTIVES: To create visual models to represent number and percent
To generate problem solving strategies
To practice computational skills with large numbers and money

PRE-SKILLS: Visual idea of 50%, 30%, 20% of a number, multiplication with money amounts and whole numbers, finding percentage given the base

MATERIALS: Graph /grid paper, poster board, art supplies (optional)

NOTES: Students should be encouraged to focus on their own areas of interest and not think necessarily of a replacement for Boston Garden. Any sport or recreational activity could be used. Focus should be on breakdown of seating. Using a grid paper with each block representing one or more seats is important in the planning. It is helpful to sketch the seating area and use visual estimations for 50%, 30%, 20% of the seating area. Counting individual seats and building to the total may work better than starting with the total number of seats, but different learning styles will influence how students will want to proceed. Generate ideas and suggestions but avoid a step-by-step "how-to." "Number of Seats" box must have whole numbers; "%" box may not. Stress that "%" are guidelines only. Calculator use is optional at the discretion of the teacher. Students may need to discuss some reasonable sizes of arenas or stadiums in order to create a frame of reference for numbers of seats. See Press Notes in each section.

FURTHER DISCUSSION / FOLLOW-UP: Bringing in sketches of seating for local arenas and stadiums (found in ticket information brochures) may stimulate interest and provide a starting point for less creative students. Some students may generate three dimensional models or include intricate details. Model designs should be displayed. Voting for the best designs can generate interest and reward effort. Prizes in several categories (largest, smallest,most original, most versatile, etc) will allow for recognition of more students.

Discuss why one wouldn't simply increase income by charging the same higher price for all seats. (Are all seats "equal in value"? Is there an issue of marketing? etc). See World Wrestling Federation activity.

Headline: The Reporters' Contest

The Boston City Council has decided to sponsor a contest for sports reporters only. The contest asks for reporters to submit an outline for that "ideal Boston Sports Facility" that everyone has been talking about. Your editor has asked you to participate in the contest because you are creative and will be able to come up with a great idea for the facility. You are going to have to put a lot of thought and effort into the contest because if you win, you may have a role in the actual building project.

These are the guidelines for the contest:

1. Decide which sport(s) will be played in the facility and design it accordingly. (Think of the number and locations of seats, the number of different uses, the size of the floor, the playing surface, etc.)

2. Make sure you show the playing surface, seating section, and the areas where the aisles will be placed.

3. You must have 3 price categories for seats, colored with 3 different colors. Approximately 30% should be high priced, 50% mid-priced, and 20% inexpensive seats. (These percents do not have to be exact, but they should be close. You must know how many of each kind of seat as well as the percent.)

4. The outline you submit for the contest must include a drawing or model of your facility appropriately labeled, decorated, etc. You must also submit the chart below to show the seating breakdown, projected uses and a suitable name.

Seats				
Color of Model	Number	% Total	Price of Each Seat	Total $
Total Number of Seats =		Gross Income for Sell-Out Crowds =		
Name for Arena/Stadium:				
Use(s) for Arena/Stadium:				

Why is it important to have different categories of seats?
How could we increase the income from ticket sales?
Would a different percent breakdown be better?

EDITOR'S NOTES

TITLE: A Store for Sports

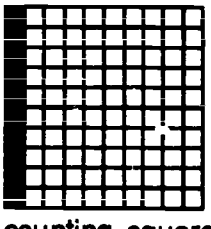
NATURE OF ACTIVITY: Grid Design

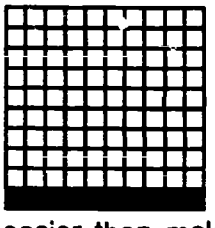
OBJECTIVES: To visualize percent as part of 100
To reinforce 100% = whole
To find percent of 100

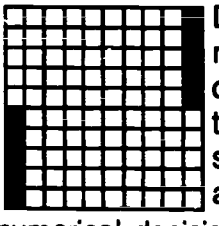
PRE-SKILLS: Knowledge of percent as "per hundred," knowledge of 9 sq. ft. as 1 sq. yd., understanding of area as counting square units

MATERIALS: Graph / grid paper, markers, newspaper (s) classified section

NOTES: This is an introductory experience. Discussion about ways to represent 10%, 15%, etc. should emphasize different visual models. Design will show floor surface area designations only. Teacher may discuss how shelving, racks, stand space, etc. could yield different percents if the volume of the store space were considered.







Doing one store as a class exercise may be necessary to give less confident students a model process to follow. Weaker students should stick to 100 sq. yds. only. Dividing a 10X10 grid visually first and then counting squares is easier than making numerical decisions and trying to force a sum of 100.

For simplicity, aisles, walkways, storage, etc. should not be included except for better students.

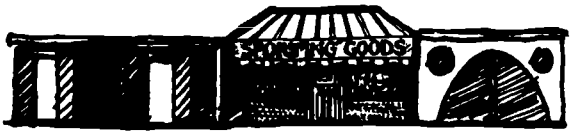
Better students can be encouraged to depart from a square shape and to use areas other than the 100 sq. yds. Students should use the newspaper to get cost estimates of rents. They will generally be per square foot, and wide variations will exist. The source could be a parent or friend who pays store rent as well as a newspaper.

FURTHER DISCUSSION / FOLLOW-UP: Discuss the ways decisions about space allotments for individual sports may be made. (Eg. popularity of sport, size of equipment, number of participants, season, etc.) There are no wrong answers but students should back up their decisions with opinions and facts. Discuss the range of rent estimates that will result and the reasons (location, facilities nearby, utilities, etc.). Use opportunities to stress mental multiplication. For example:

If 10% => 20 boxes (200 sq. yd. store)
then 40% => 4X20 , 60% => 6X20, etc...

More elaborate designs could be done for display using a large grid or cutouts of various subdivision surfaces. Another option would be to tape off classroom floor space letting one tile represent a certain number of square feet.

Headline: A Store For Sports



Because of your general knowledge of sports, a friend has asked for your help designing a small sports shop for the new Boston Garden Complex. You have agreed to sketch a possible plan, but you are restricted by these conditions:

- The total floor area must be at least 100 sq. yds. and no more than 1600 sq. yards. Since it will be in a new building, any shape can be used.
- The customer service area(s) must be 10% of the total floor space. It can be divided into more than one station.
- The shop must service at least 5 sports, one of which may be a miscellaneous category.
- Your friend will need a name for the store and would appreciate an estimate of a reasonable monthly rent.

Completing the planning chart below will help to organize the data for your sketch.

If you design the store on graph paper, color the subdivisions, and explain the reason for the choices of sports and percents, it will help your friend to make decisions about which plan to use.

Name of store _____
No. of Sq. Yds. _____ **Sq. Ft.** _____
Est. Cost/Sq. ft. _____ **Source of Info.** _____

Subdivisions	%	No. Sq. Yds.
Customer Service	10%	
TOTAL	100%	

Are your choices for sports and their percent of the total area based upon expected sales? Will the most popular items require the most space?

Editor's Notes: SCOUTING THE PROS

The Boston Celtics

The stats sheets for the Celtics are in both worksheet and grid form. The students are to watch a basketball game on TV for homework or on videotape as a class activity. While watching the game, they are to use the tally sheets or grids* to record the statistics of their chosen player.

After students have completed their stat sheets, they can write a comprehensive article on the game watched, incorporating the statistics gathered.

Students are to choose one player and record his statistics throughout the game. Students are to record the number of Field Goal Attempts, Field Goals Made, Free Throw Attempts, Free Throws Made, Offensive Rebounds, Defensive Rebounds, and Minutes Played. They may do this by making slash marks in the appropriate places on the tally sheet or by using the grid and following the key. Use one grid for each quarter.

Students should then transfer their information to the summary section at the bottom of the tally Sheet and complete the "totals sheet." They can then compute the Field Goal Percentage, Free Throw Percentage, and Percentage of minutes played. Once completed, they can begin their article.

Note: If time is limited, students could watch just one quarter, one half, or a specified time such as 15 minutes, 30 minutes, etc.

*When using the grid, remind students to place their symbols in the same area where the play took place.

Celtics Statistics
Tally Sheet

Opposing Team: _____ Date: _____

Player: _____ Number: _____ Position: _____

Quarter	Field Goal Attempts	Field Foals Made	Free Throw Attempts	Free Throws Made	Offensive Rebounds	Defensive Rebounds	Minutes Plaued
First							
Second							
Third							
Fourth							
Overtime							

Summary of Tally

	FGA	FGM	FTA	FTM	Off. Reb.	Deb. Reb.	Minutes Played
First Quarter	_____	_____	_____	_____	_____	_____	_____
Second Quarter	_____	_____	_____	_____	_____	_____	_____
Third Quarter	_____	_____	_____	_____	_____	_____	_____
Fourth Quarter	_____	_____	_____	_____	_____	_____	_____
Overtime	_____	_____	_____	_____	_____	_____	_____
Totals	_____	_____	_____	_____	_____	_____	_____

Celtics Statistics
Totals Sheet

Totals & Percentages

Field Goal Attempts _____

Field Goals Made _____

Percentage _____ FGP: $\frac{\text{goals made}}{\text{goals attempted}}$ (nearest thousandth)

Free Throw Attempts _____

Free Throws Made _____

Percentage _____ FTP: $\frac{\text{throws made}}{\text{throws attempted}}$ (nearest thousandth)

Offensive Rebounds _____

Defensive Rebounds _____

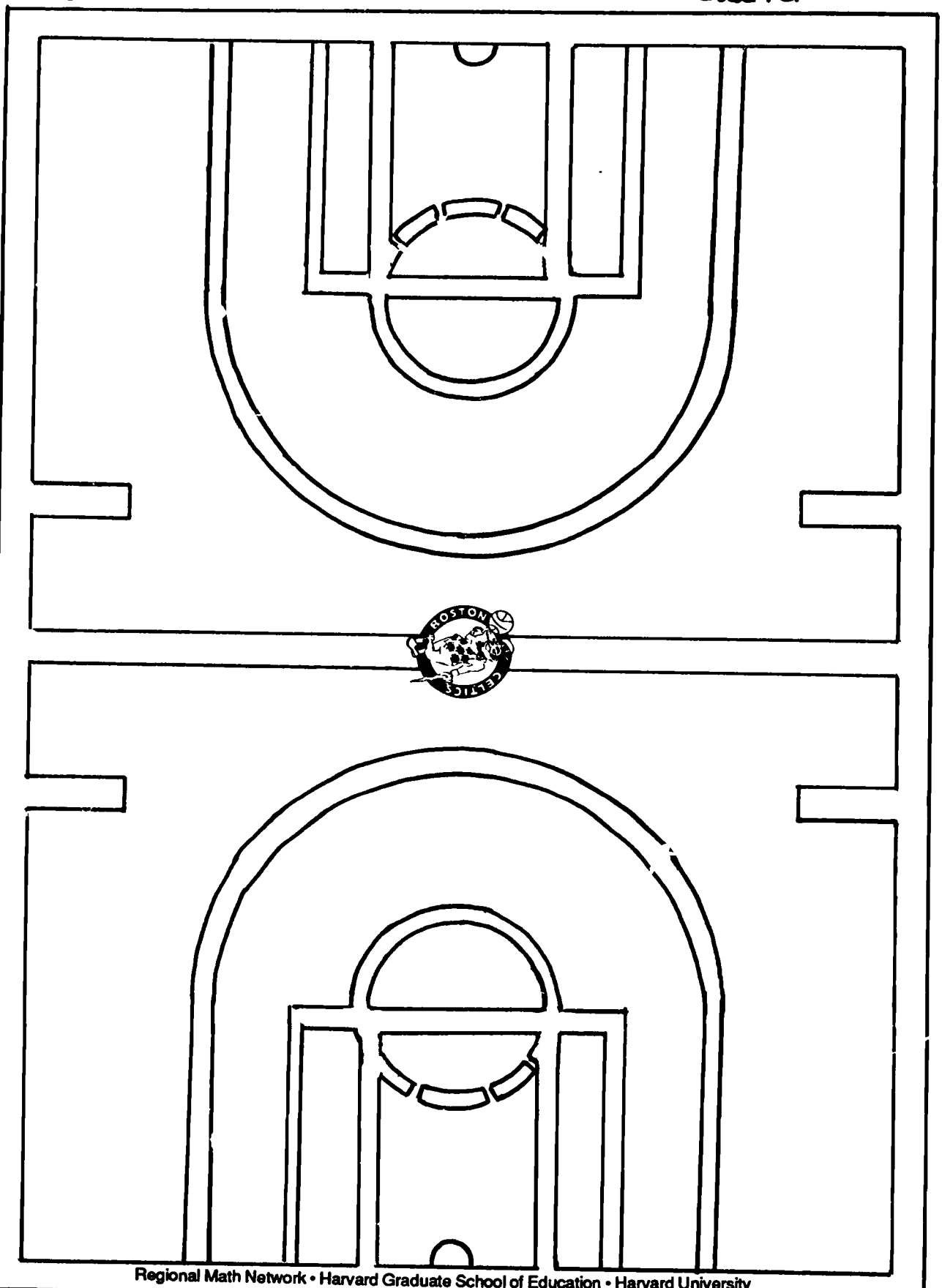
Total Minutes Played _____

Percentage of Game Played _____ Pct.: $\frac{\text{minutes played}}{\text{total time}}$ (nearest thousandth)

Celtics Stats

Player

Quarter



FG = field goal attempt
(FG) = field goal made

FT = free throw attempt
(FT) = free throw made

O = offensive rebound
D = Defensive rebound

Editor's Notes: Scouting the Pros

The Boston Bruins

The stats sheets for the Bruins are in both worksheet and grid form. The students are to watch a hockey game on TV for homework or on videotape as a class activity. While watching the game, they are to use the tally sheets or grids* to record the statistics of their chosen player.

After students have completed their stat sheets, they can write a comprehensive article on the game watched, incorporating the statistics gathered.

Students are to choose one player to "follow" throughout the game. They are to watch how many shots on goal the player attempts, how many shots earn assists, and how many score a goal. They are also to record penalty minutes. Students are to mark slashes in the appropriate box on the tally sheet or use the grid provided and follow the key at the top of the page. Use one grid for each period.

Transfer the information gathered to the bottom of the Tally Sheet and compute the percentage of assists, goals, and time spent in the Penalty Box.

Students should then write a comprehensive article on the game, focusing on the player watched and incorporating the statistics gathered.

Note: If time is limited , students could just watch one period or a specified time such as 15 minutes , 30 minutes, etc.

*When using the grid, remind students to place their symbols in the same area where the play took place.

Bruins Statistics
Tally Sheet

Opposing Team:_____ Date:_____

Player:_____ Number:_____ Position:_____

Period	Shots on Goal	Assists	Shots Made	Penalty Time
First				
Second				
Third				
Overtime				
Totals				

Percentage of Shots Made _____ Pct.: $\frac{\text{Shots made}}{\text{Shots on goal}} \times 100$ (nearest tenth)

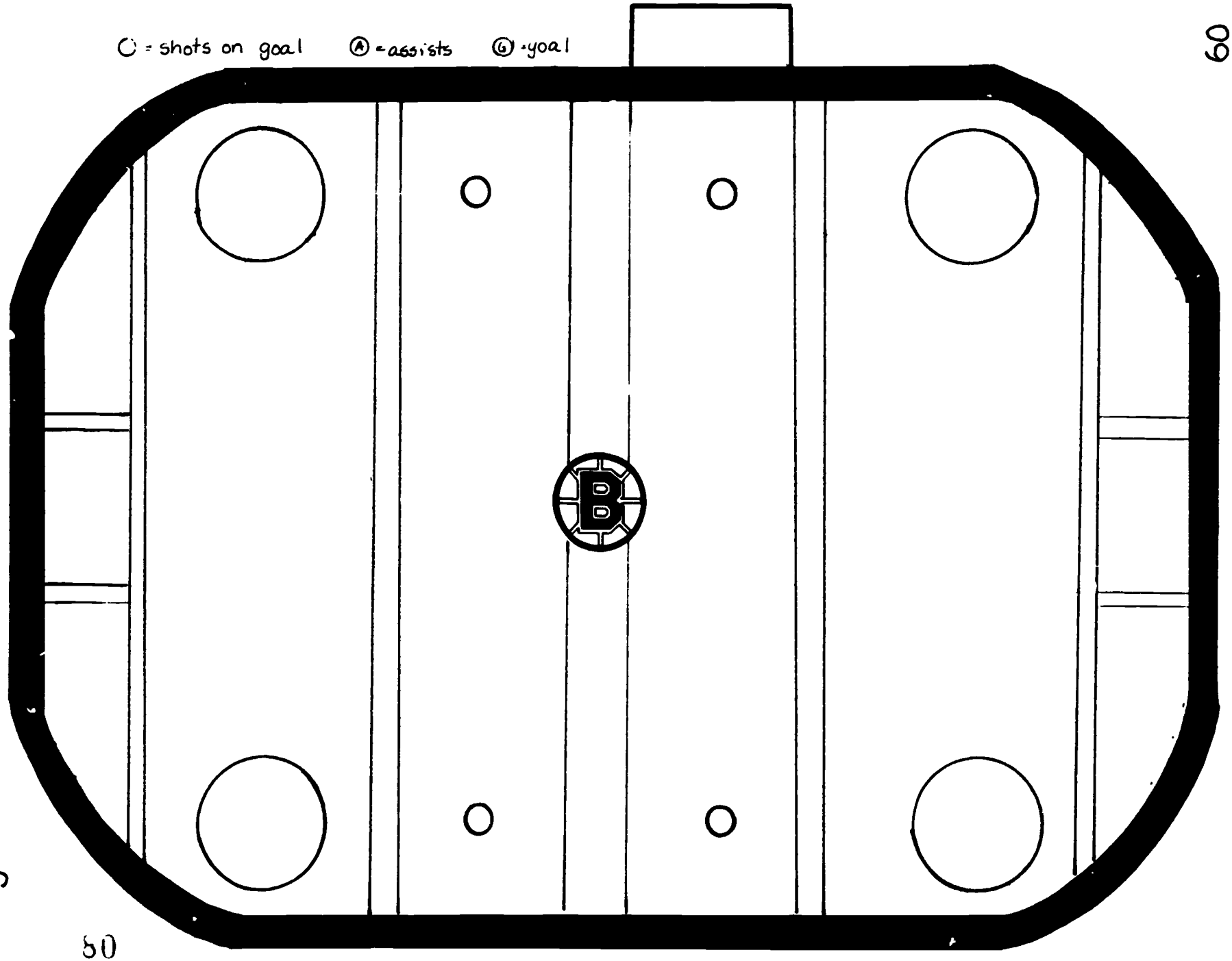
Percentage of Time Spent in Penalty Box _____ Pct.: $\frac{\text{Penalty Min.}}{\text{Total Min.}} \times 100$ (nearest tenth)

Number of points _____ Pct.: Goals + Assists

Bruins' Stats

Player _____ Period _____

C = shots on goal A = assists G = goal



Baseball - Fenway Park

Boston Red Sox / Fenway Park Information

FENWAY PARK
Home of the RED SOX -- Boston, Massachusetts

Constructed 1912 (Rebuilt 1934)

Seating Capacity:

Roof	1,568
Boxes	13,250
Reserved Grandstand	12,202
Bleachers	6,563
Total	33,583

Record Crowds:
47,627 (N.Y., 2 games, Sept 22, 1935)
46,995 (Det., 2 games, Aug. 19, 1934)
46,766 (N.Y., 2 games, Aug. 12, 1934)

Post-War & Single Game Record:
36,388 (Clev., Apr. 22, 1978)

Night Game Record:
36,228 (N.Y., June 28, 1949)

Opening Day Record
35,343 (Balt., Apr. 14, 1969)

Distance to Fences:

	FEET	METERS
L.F.	315 ft.	96 m
L.C.F.	379 ft.	115.5 m
C.F.	390 ft.	118.9 m
Deep C.F.	420 ft.	128 m
Deep R.F.	380 ft.	115.8 m
R.F.	302 ft.	92 m

Height of Fences:

	FEET	METERS
L.F. Wall	37 ft.	11.3 m
(Screen extends 23 ft. 7m)		
C.F Wall	17 ft.	5.2 m
Bullpens	5 ft.	1.5 m
R.F.	3-5 ft.	.9-1.5 m

75-YEAR FENWAY FACTS

Other teams have played in Fenway Park besides the Red Sox. In 1914 the "Miracle Boston Braves" played their World Series games in Fenway enroute to a four-game sweep over the favored Philadelphia A's while Braves Field was under construction. The Boston Patriots (now New England Patriots) were fall occupants from 1963-68 before eventually ending up in Foxboro. They were not the first pro football team in Fenway however. The Boston Redskins played four years there before heading to Washington in 1937. The Boston Yanks played there from 1944 48 prior to traveling to New York, Dallas, Baltimore (where they became the Colts) and now Indianapolis.

Collegiately, Boston College teams of the great Frank Leahy era and Boston University with stellar quarterback Harry Agganis (later a promising Red Sox first baseman who died during the 1955 season) also played home games in Fenway Park.

WHY THE NAME FENWAY?

The new ballpark was constructed for the 1912 season and was named by then Red Sox owner John I. Taylor. He chose the name because "It's in the Fenway section (of Boston), isn't it? Then call it Fenway Park." It was also Taylor who changed the club's name from Pilgrims to Red Sox in 1907.

SOME HIGHLIGHTS

First Fenway fire: May 8, 1926. The bleachers along the leftfield foul line burned down and weren't replaced, giving fielders the chance to snare foul flies behind the third base grandstand.

First Sunday game at Fenway: July 3, 1932, a 13-2 loss to the Yankees. Sunday baseball was approved in Boston three years earlier, but not at Fenway due to its proximity to a church. The Red Sox then played their Sunday games at Braves Field on Commonwealth Ave. until the law was changed.

Second Fenway fire: January 5, 1934. A four-alarm, five-hour blaze that virtually destroyed the construction underway to refurbish the park by new owner T.A. Yawkey.

New Fenway opened: April 17, 1934. The Washington Senators, led by SS-manager Joe Cronin beat the Red Sox, 6-5 in 11 innings.

Biggest baseball crowds at Fenway: 47,627 for a Yankees doubleheader on September 22, 1935....46,9[illegible] for a Detroit Tigers doubleheader on August 19, 1934....And -- a week earlier -- 46,766 to say goodbye to Babe Ruth at a Yankees doubleheader on August 12, 1934. Those crowds will never be equalled under Fenway's current dimensions. More stringent fire laws and league rules after World War II prohibited overcrowding that was permitted in the Thirties.

1947: Arc lights were installed, the third to the last team among the then 16 major league clubs to do so. The Red Sox defeated the White Sox, 5-3, in Fenway's first night game on June 13.

1947: Green paint replaced advertisements covering the left-field wall No more Calvert owl ("Be wise"), Gem Blades ("Avoid 5 o'clock shadow"), Lifebuoy ("The Red Sox use it") and Vimms ("Get that Vimms feeling").

1948: Red Sox games were first televised at Fenway.

Additional Fenway Information

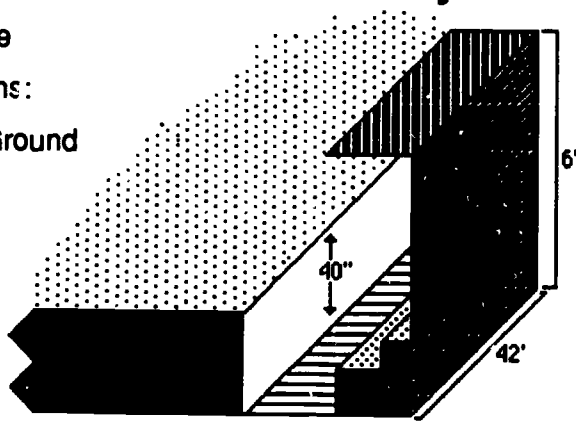
Seats are 17" wide

Dugout Dimensions:

40" Below Ground

6' 11" High

42' Long



Locker Dimensions

3' wide 6' high

2 1/2' deep

Roof Boxes rent for $32,000 to $45,000 per year

They are hotel room size with 14 seats.

Gate (ticket sale revenue)

60% to home team

40% to visiting team

Security Force

30 private

30 Boston police

12 Back-up

Warning track is 19 feet wide

The outfield has about 50 water drains

The foul line is along the ground beyond

the infield is made of painted wood

AMERICAN LEAGUE 6-YEAR ATTENDANCE

	1985	1984	1983	1982	1981	1980	AVG.
California	2,567,427	2,402,997	2,555,018	2,807,360	1,441,545	2,297,327	2.35 M
New York	2,214,587	1,821,815	2,257,976	2,041,219	1,614,353	2,627,417	2.10 M
Kansas City	2,162,715	1,810,018	1,963,875	2,284,464	1,279,403	2,288,714	1.96 M
Detroit	2,286,609	2,704,794	1,829,636	1,636,058	1,149,144	1,785,293	1.90 M
Baltimore	2,132,240	2,045,776	2,042,071	1,613,031	1,024,247	1,797,438	1.78 M
Boston	1,786,311	1,661,618	1,782,285	1,950,124	1,060,379	1,956,092	1.70 M
Milwaukee	1,360,265	1,608,509	2,397,131	1,978,896	874,292	1,857,408	1.68 M
Toronto	2,468,925	2,110,009	1,930,415	1,275,978	755,083	1,400,327	1.66 M
Chicago	1,670,075	2,136,988	2,132,821	1,567,787	946,651	1,200,365	1.61 M
Oakland	1,334,609	1,353,231	1,294,941	1,735,489	1,304,052	842,259	1,31 M
Texas	1,112,461	1,102,391	1,363,469	1,154,432	850,076	1,198,175	1.13 M
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Lg. Totals	24,531,457	23,960,053	23,991,053	23,080,449	14,065,986	21,890,052	21.93 M

EDITOR'S NOTES

TITLE: What's the Problem at Fenway Park? **NATURE OF ACTIVITY:** Problem posing

OBJECTIVE: To formulate word problems
To identify relevant data in a problem solving situation
To choose appropriate problem solving strategies

PRE-SKILLS: Some problem solving experience

MATERIALS: Fact sheets (see press kit), brochures, flyers, etc. about facility (optional)

NOTES: This activity requires students to focus on the facts in a problem situation as well as the question and solution. Discuss fact sources other than those in the teacher packet (Press Kit). Students may be able to bring in program books, brochures, etc. or have information from personal trips, T.V. viewing, etc. To start the thinking process, choose one or two pieces of data and have students brainstorm to produce possible questions. Focus on fluency first then select those questions that can be solved with the students' background in mathematics. Discuss the kinds of questions that could be asked. How many? How much more? What fraction?, What percent? How many ways?, What's the least?, etc.

Encourage questions that require varied strategies such as single computation, multiple computations, sketching, efficient counting, chart or list, etc.
Plain paper may be used so the number of problems is not limited. Students may fold over solution column so that problems can be posted or exchanged for sharing.

FACTS	SAMPLE QUESTION(S)	SOLUTIONS
The distance from home plate to the left field wall is 96m, to the center field fence is 118.9m, and to the right field fence is 92m.	How many centimeters further is it to the center field fence than to the right field fence?	RF = 92m or 9200cm CF = 118.9m or 11890cm 11890 - 9200 2690cm 2690 further

FURTHER DISCUSSION / FOLLOW-UP: Put some constraints on the kinds of questions that can be used. For example:

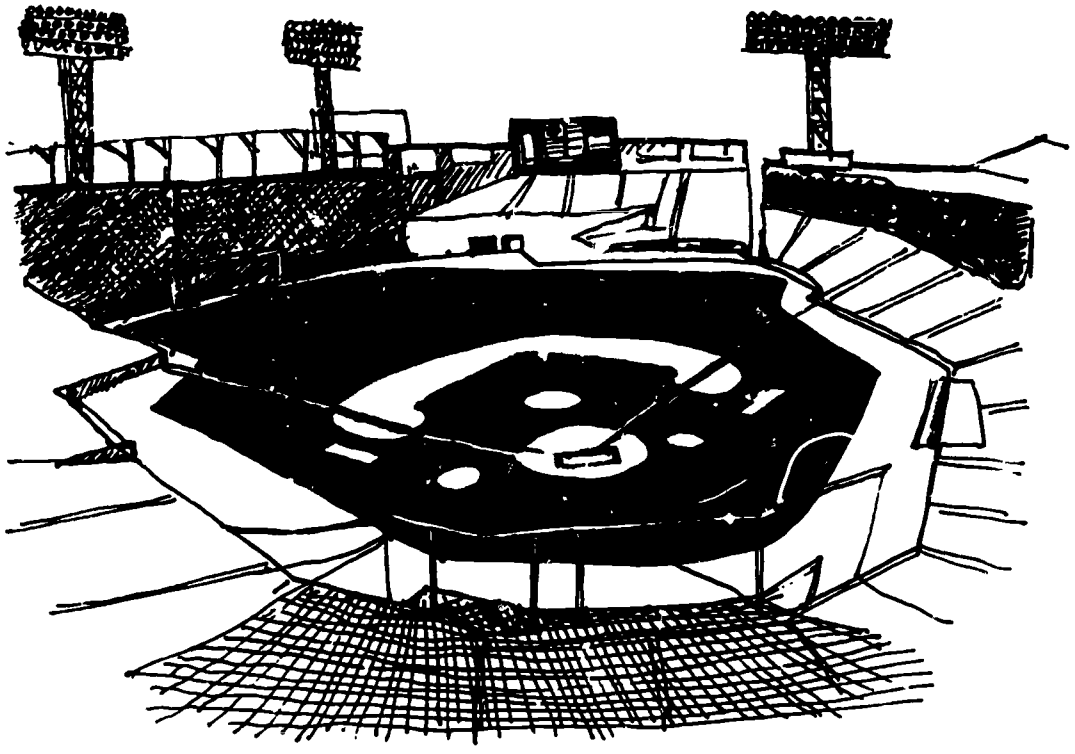
Must involve more than one operation for solution.
Must involve a particular operation(s).
Must involve a percent or decimal.
Must have extraneous data among facts.

This can be used as a bulletin board activity where the teacher posts one or more facts on a regular basis and students contribute questions (and solutions). Plan a fact or data gathering field trip to Fenway Park. The problems generated could be put on 3x5 cards (with answers on the back) to become a problem solving deck. See other What's the Problem at _____ activities.

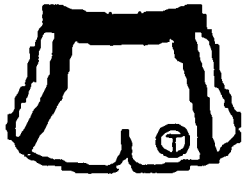
Headline: WHAT'S THE PROBLEM AT FENWAY PARK?

The Harvard Regional Math Network has asked your editor to suggest some problem solving activities that are related to sports. Guess who was assigned this challenge! You must use your resource file (as well as your memory) for facts to make up some sample problems that other students might enjoy. Record your problems in your reporter's notebook using the following headings:

FACTS	QUESTION(S)	SOLUTION(S)



EDITOR'S NOTES



TITLE: Hot Sox!

NATURE OF ACTIVITY: Long-term project on graphing

OBJECTIVES: To reinforce the concept of decimals
To practice converting fractions to decimals
To interpret and analyze line graphs
To construct a line graph

PRE-SKILLS: Decimal concept, graphing techniques, converting fractions to decimal form

MATERIALS: Chart, grid paper, newspaper, calculator (optional)

NOTES: This is an April to June project. Students will choose (or be assigned) a Red Sox player (not a pitcher). Teacher will provide (from the paper) the weekly cumulative statistics for the team. Students will record results for their player and find the weekly results (by subtracting). Both cumulative and weekly averages will be graphed on the same axes (use different colored pens or pencils).

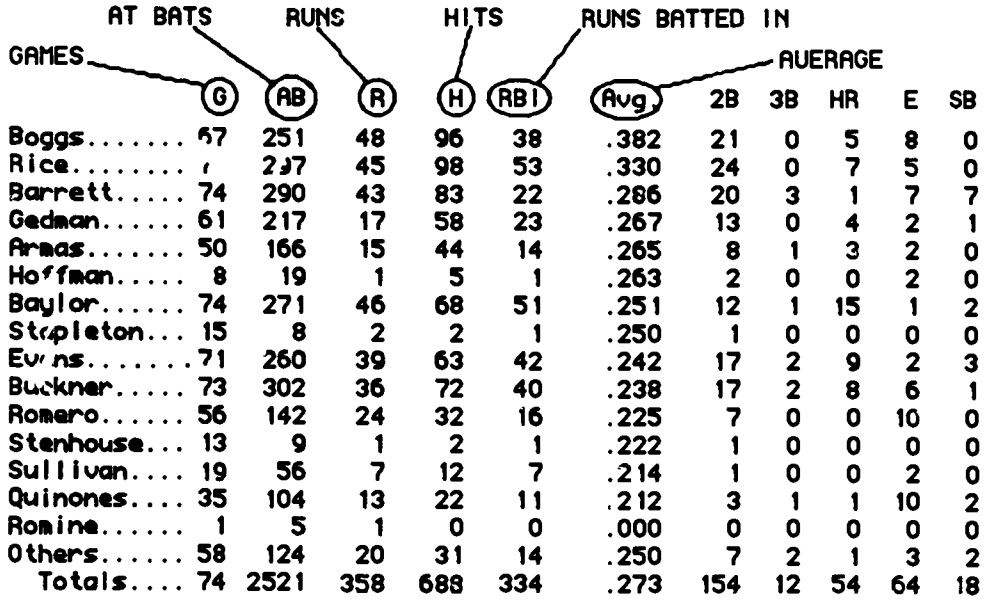
- It is best if this activity is done on the same day, once a week.
- If a player has no 'at bats', the weekly column should be left blank. Graph the cumulative average as a horizontal line and plot nothing for that week on the weekly average graph.
- Graphs should be set up so each block represents .020 or .025 (round to nearest multiple of .020 or .025 before plotting).

Students need to understand this use of the word "average" (Hits divided by total number of at bats). Student graphs can be kept in a folder or posted on the wall. Weekly discussion about trends, patterns, predictions, etc; is important.

FURTHER DISCUSSION / FOLLOW-UP: Predict what the outcome of the player's season will be. Predict what the outcome of the team's season will be. Students can compile the information on "their players" so they can write an article at the end of the season. Discuss the visual image of the cumulative vs. the weekly graph, particularly at the end of the season. One week's average changes the cumulative average much less towards the end of the season than at the beginning.

HOT SOX

Below is a sample of cumulative Batting (and Pitching) averages for the Boston Red Sox. Such stats appear daily, but you should clip one each week on the same day. The activity needs to begin with the first set of statistics of the season to insure accuracy. The information you will need has been circled, but the other stats have been noted so you can give some variety to the activity.



	G	AB	R	H	RBI	Avg	2B	3B	HR	E	SB
Boggs.....	67	251	48	96	38	.382	21	0	5	8	0
Rice.....	[illegible]	297	45	98	53	.330	24	0	7	5	0
Barrett.....	74	290	43	83	22	.286	20	3	1	7	7
Gedman.....	61	217	17	58	23	.267	13	0	4	2	1
Armas.....	50	166	15	44	14	.265	8	1	3	2	0
Hoffman.....	8	19	1	5	1	.263	2	0	0	2	0
Baylor.....	74	271	46	68	51	.251	12	1	15	1	2
Stapleton...	15	8	2	2	1	.250	1	0	0	0	0
Evans.....	71	260	39	63	42	.242	17	2	9	2	3
Buckner.....	73	302	36	72	40	.238	17	2	8	6	1
Romero.....	56	142	24	32	16	.225	7	0	0	10	0
Stenhouse...	13	9	1	2	1	.222	1	0	0	0	0
Sullivan....	19	56	7	12	7	.214	1	0	0	2	0
Quinones....	35	104	13	22	11	.212	3	1	1	10	2
Romine.....	1	5	1	0	0	.000	0	0	0	0	0
Others.....	58	124	20	31	14	.250	7	2	1	3	2
Totals....	74	2521	358	688	334	.273	154	12	54	64	18

Headline: HOT SOX

The Red Sox are the hottest team in town right now, and your editor is already preparing for the end-of-the-year-supplement. To prepare for this, each sports reporter is asked to pick one Red Sox player and keep track of his statistics. (You can't pick a pitcher because the editor is doing an article on the pitchers.)

You're going to keep a record of the player's batting average by following the weekly and cumulative average, and plot your information on a graph for easy reference.

You decide you will follow _____. You will also want to make sure you remember to do this every week so you're going to set aside a couple of minutes every _____ to work on this.

You've set up a chart for the stats, and the axes for the graph. You've also written a note to yourself on computing the weekly averages.

NOTE: TO DETERMINE WEEKLY AVERAGE YOU:

1) Find the difference between last week's and this week's hits.
2) Find the difference between last week's and this week's times at bat.
3) Use those numbers to find the weekly batting averages.
   hits ÷ times at bat

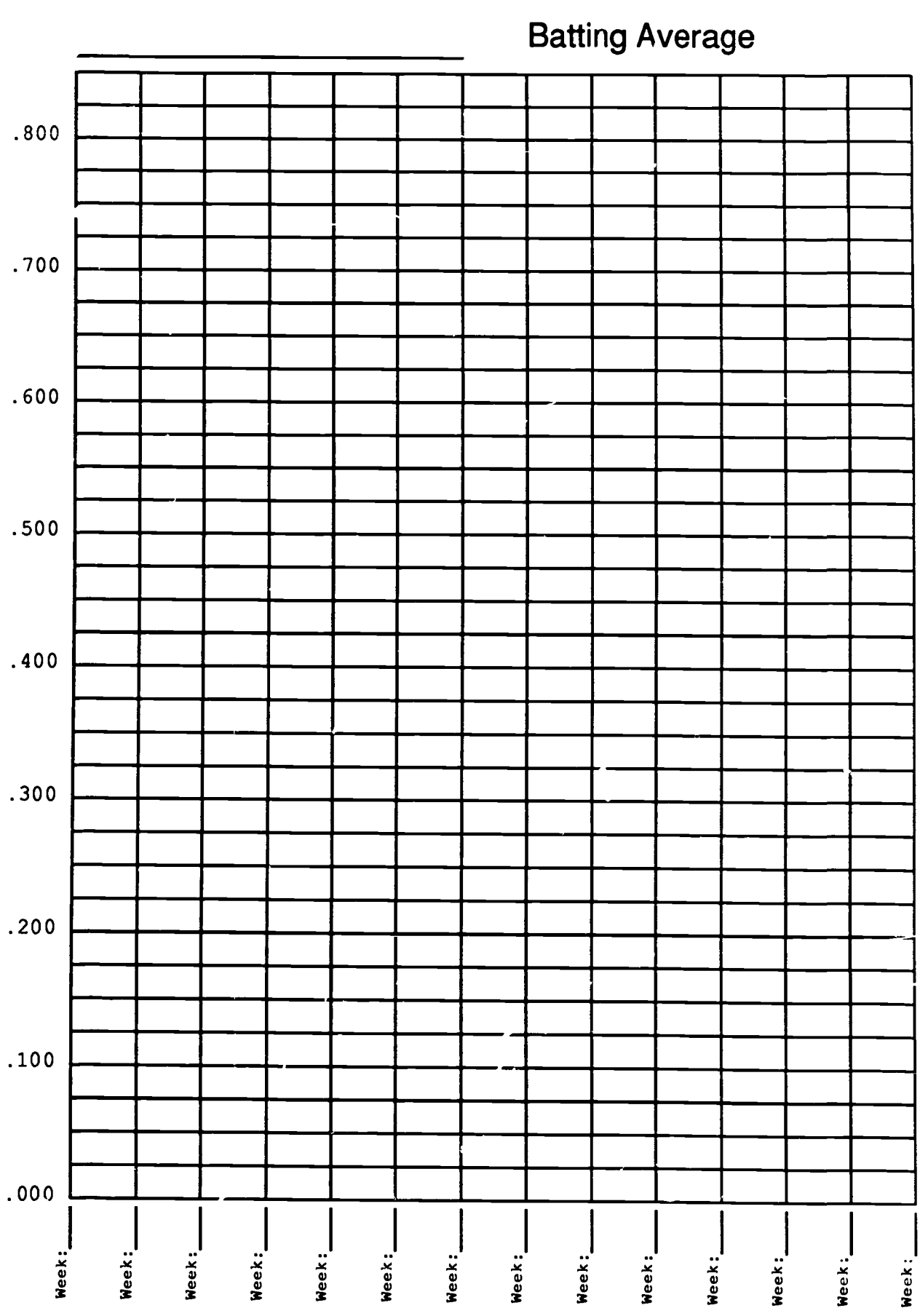
Example: Wade Boggs' Stats

	Cumulative			Weekly		
	Hits	Times at Bat	Avg.	Hits	Times at Bat	Avg.
Week 1	4	10	.400	4	10	.400
Week 2	7	20	.350	7-4=3	20-10=10	
Week 3	15	40	.375			

_____ Stats

Name of Player

	Cumulative			Weekly		
Week#	Hits	At Bat	Avg.	Hits	At Bat	Avg.


Batting Average
.800
.700
.600
.500
.400
.300
.200
.100
.000
Week:
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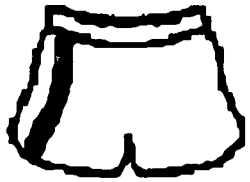
EDITOR'S NOTES



TITLE: Time After Time

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To understand the concept of time zones and determine flight departure and arrival times

PRE-SKILLS: Computing with time

MATERIALS: Map (given), Clock (optional)

NOTES: Some explanation of time zones should precede the lesson. Assume all games are televised live (no tape delay). Students may want to label time zones on map (Eastern, Central, Mountain and Pacific). Use standard times.

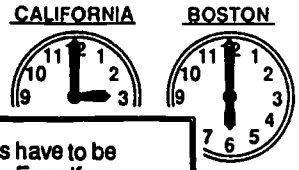
Knowing team names (West Division of American League) may be helpful.
- Chicago White Sox
- Kansas City Royals
- Minnesota Twins (They play in Minneapolis).
- Texas Rangers (They play in Arlington, just outside Dallas).
- California Angels (They play in Anaheim, just outside Los Angeles).
- Oakland Athletics
- Seattle Mariners

Manipulation with an actual clock may be better than subtracting and adding times for some students. Students should be able to generalize about the number of minutes difference between East to West and West to East flights due to the Jet Stream. Discuss a flight to Europe. Which way would be longer, going or returning?

FURTHER DISCUSSION / FOLLOW-UP: This activity can lead to additional discussion in science and social studies (rotation of earth, jet lag, latitudes, etc.).

Check newspaper or TV guide for starting times of games in any sport. Have students find the times that the opponents' families will be watching in their home cities. Discuss daylight saving time. How does it change the answers to page one?

Headline: TIME AFTER TIME



When traveling with the Red Sox you always have to be aware of the time changes around the country. Even if you plan to watch them on TV you have to be aware of time differences.

Each time zone represents a change of 1 hour. If it's 5:00 PM in Boston, it's 4:00 PM in Chicago and 2:00 PM in L.A. It's very easy to be confused as you travel and you must keep your watch correct. You need some pre-season practice.

If a game starts at 7:30 PM in Boston, at what time will the game be watched by people in:

Kansas City 6:30 PM
Seattle 4:30 PM
Dallas 6:30 PM

Boston 7:30 PM
Oakland 4:30 PM
Chicago 6:30 PM

In an afternoon game at Fenway Park (1:05 start) what time would the game be shown in:

Kansas City 12:05 PM
Los Angeles 10:05 AM

Dallas 12:05 PM
Minnesota 12:05 PM

What would you put in the T.V. guide?

LOCATION OF GAME	GAME TIME	TIME ON BOSTON TV	TIME ON OAKLAND TV
Oakland	7:30 PM	10:30 PM	7:30 PM
Seattle	8:00 PM	11:00 PM	8:00 PM
Chicago	7:30 PM	8:30 PM	5:30 PM
Oakland	1:00 PM	4:00 PM	1:00 PM
Minnesota	1:30 PM	2:30 PM	11:30 AM
Kansas City	7:00 PM	8:00 PM	5:00 PM
Boston	2:00 PM	2:00 PM	11:00 AM

Do many people in Boston watch the West Coast games? Are they more likely to watch day or night games? How can you remember what time it is without resetting your watch in each time zone?

Reading flight schedules is almost as hard as keeping your watch up to date. The arrival time is usually given according to the location time at the destination. You may have to think of home time first and then convert for the new zone.

FLIGHT LEAVE	FLIGHT ARRIVE	FLIGHT TIME	DEPARTURE TIME	ARRIVAL TIME
BOS →	LA	6 HRS	5:00 PM	8:00 PM
LA →	BOS	5 HRS 15 MIN	9:10 AM	5:25 M
BOS →	CHI	2 1/2 HRS	3:15 PM	4:45 PM
CHI →	BOS	2 1/4 HRS	12:45 PM	4:00 PM
BOS →	MINN	2 HRS 55 MIN	8:35 AM	10:30 AM
MINN→	BOS	2 HRS 35 MIN	8:15 AM	11:50 AM
BOS →	DAL	3 HRS 40 MIN	7:30 AM	10:10 AM

Did you notice anything odd about the flight times?

BOS to LA 6 Hours
LA to BOS 5 Hours 15 Min.
Difference 45 min.

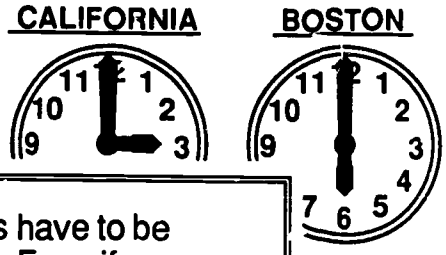
BOS to CHI 2 HRS 30 MIN.
CHI to BOS 2 HRS 15 MIN.
Difference ¼ Hour = 15 Min.

BOS to MINN 2 HRS 55 MIN
MINN to BOS 2 HRS 35 MIN
Difference 20 min.

BOS to DAL 3 HR 40 MIN
DAL to BOS 3 HR 30 MIN *Predict
Difference 10 min.

How can you explain these differences? Could they be due to different routes or is there another possible reason? What effect might traveling back and forth between Boston and the West Coast have on the "Natural Clock" in your body?

Headline: TIME AFTER TIME



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Dallas _____

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Oakland_____
Chicago_____

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Los Angeles _____

Dallas _____
Minnesota_____

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BOS →	MINN	2 HRS 55 MIN		10:30 AM
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Difference _____

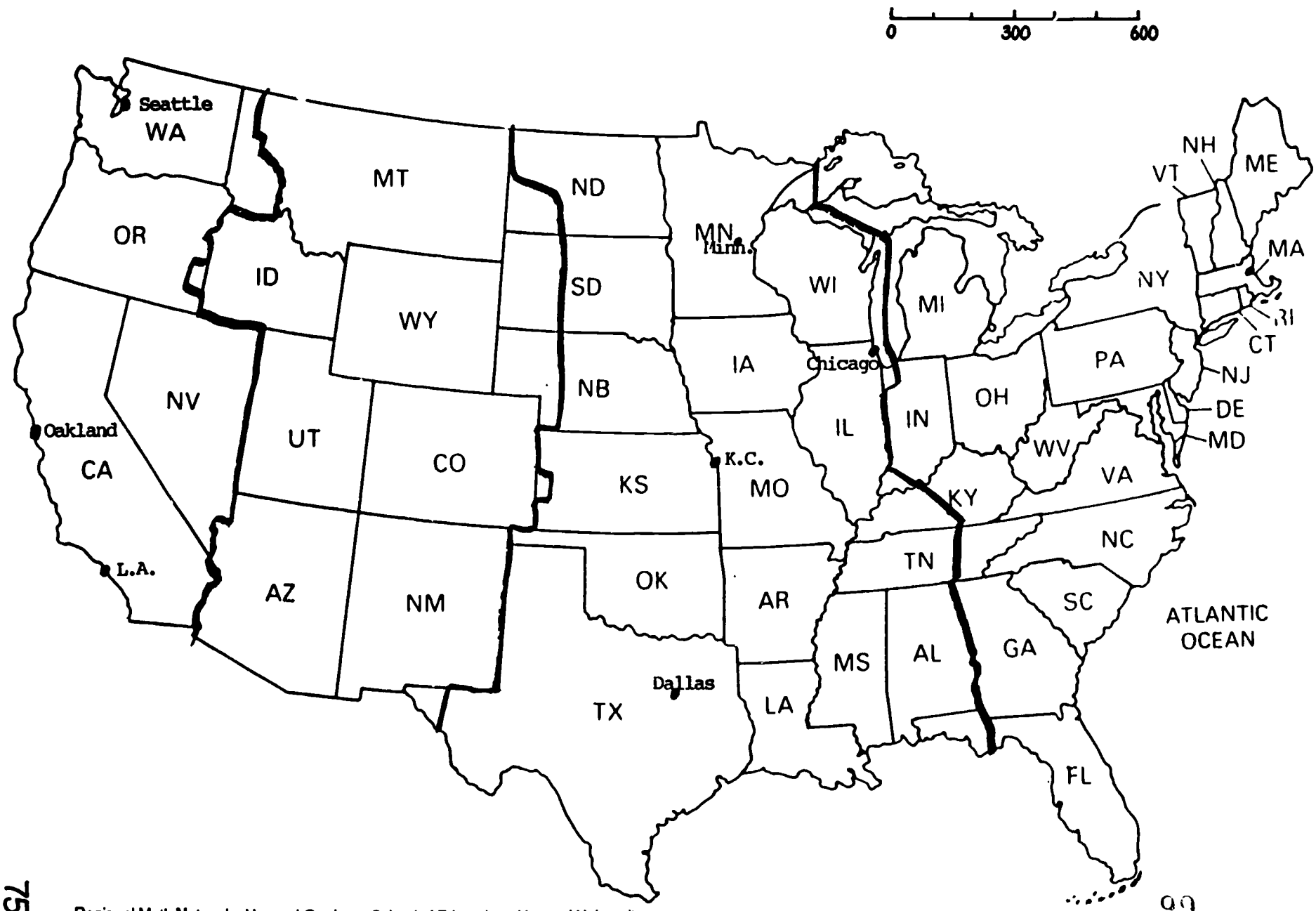
BOS to MINN _____
MINN to BOS _____
Difference _____

BOS to CHI _____
CHI to BOS _____
Difference _____

BOS to DAL _____
DAL to BOS _____
Difference _____

*Predict

How can you explain these differences? Could they be due to different routes or is there another possible reason? What effect might traveling back and forth between Boston and the West Coast have on the "Natural Clock" in your body?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KY
NC
TN
L.A.
AZ
NM
OK
AR
SC
ATLANTIC
OCEAN
MS
AL
GA
Dallas
TX
LA
FL

EDITOR'S NOTES

TITLE: Guess Who Came To The Game!

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To convert numbers written in shorthand notation (e.g. 1.66$\overline{M}$) to standard numerals
To convert standard numerals to shorthand notation

PRE-SKILLS: Reading large numbers, rounding whole numbers, multiplying by 1,000,000 (short-cut)

MATERIALS: Calculator (optional)

NOTES: A review of the short-cut methods for multiplying and dividing by 1,000,000 and practice in rounding to ten thousands would be helpful before students begin to work on this activity. Students need to understand that numbers written in the shorthand notation (AVG.) have been rounded. Do one calculation of an average (use a calculator) to illustrate this. Discuss situations where different forms (standard vs. shorthand) are commonly used (e.g. financial records vs. newspaper reports). Analyze the figures looking at individual years. List some factors which may cause differences in attendance (size of stadium, success of team, weather, no. of teams in area, etc.) Encourage all ideas as valid possibilities but require reasons for student opinions.

Mention that the official abbreviation for million is $\overline{M}$, but newspaper clipping does not include the line above the M.

FURTHER DISCUSSION / FOLLOW-UP: Scientific notation could be introduced after this worksheet has been completed. Yearly averages can be calculated by dividing league totals by the number of teams. Use these to establish which teams have the best attendance, the worst, etc. Have students bring in other examples of shorthand notation from magazines, newspapers, etc. Such clippings can be displayed with the students providing the rounded version of the standard form.

Headline: GUESS WHO CAME TO THE GAME !

Today's assignment is to analyze American League attendance figures over the last six years to see whether or not the sports channels on cable T.V. have affected game attendance. You will need to be able to compare actual figures with averages figures written in shorthand form. You had better practice converting back and forth.

AMERICAN LEAGUE 6-YEAR ATTENDANCE

	1985	1984	1983	1982	1981	1980	AVG.
California	2,567,427	2,402,997	2,555,018	2,807,360	1,441,545	2,297,327	2.35 M
New York	2,214,587	1,821,815	2,257,976	2,041,219	1,614,353	2,627,417	2.10 M
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Detroit	2,286,609	2,?..4,794	1,829,636	1,636,058	1,149,144	1,785,293	1.90 M
Baltimore	2,132,240	2,045,776	2,042,071	1,613,031	1,024,247	1,797,438	1.78 M
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Texas	1,112,461	1,102,391	1,363,469	1,154,432	850,076	1,198,175	1.13 M
Minnesota	1,651,935	1,598,463	858,939	921,186	469,090	769,206	1.04 M
Seattle	1,127,617	869,874	813,537	1,070,404	636,276	836,204	.89 M
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Lg. Totals	24,531,457	23,960,053	23,991,053	23,080,449	14,065,986	21,890,052	21.93 M

To conserve space and permit easier comparisons, large numbers are sometimes written in a shorthand notation.

Ex. California's average seasonal attendance 1980-1985 is listed at 2.35M which means 2.35 x 1,000,000 = 2,350,000

You should rewrite each of the other **AVG.** figures as in the example:

Calif 2.35M = 2,350,000
N.Y. 2.10M = 2,100,000
K.C. 1.96M = 1,960,000
Detroit 1.90M = 1,900,000
Baltimore 1.78M = 1,780,000
Boston 1.70M = 1,700,000
Milw.aukee 1.68M = 1,680,000

Toronto 1.66M = 1,660,000
Chicago 1.61M = 1,610,000
Oakland 1.31M = 1,310,000
Texas 1.13M = 1,130,000
Minnesota 1.04M = 1,040,000
Seattle .89M = 890,000
Clevland .82M = 820,000

Boston's total attendance for 1985 was 1,786,811 which rounded to the nearest ten thousand is 1,790,000. This is written as 1.79M. Rewrite the other Boston and Seattle figures in the shorthand form (rounding to the nearest ten thousand first).

	1985	1984	1983	1982	1981	1980
Boston	1,786,811	1,661,618	1,782,285	1,950,124	1,060,379	1,956,092
	1.79M	1.66 M	1.78 M	1.95M	1.06 M	1.96 M
Seattle	1,127,617	869,874	813,537	1,070,404	636,276	836,204
	1.13M	.87M	.81M	1.07 M	.64M	.84 M

What are three factors other than cable T.V. that could influence the total attendance figures for each team?

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New York	2,214,587	1,821,815	2,257,976	2,041,219	1,614,353	2,627,417	2.10M
Kansas City	2,162,715	1,810,018	1,963,875	2,284,464	1,279,403	2,288,714	1.96M
Detroit	2,286,609	2,704,794	1,829,636	1,636,058	1,149,144	1,785,293	1.90M
Baltimore	2,132,240	2,045,776	2,042,071	1,613,031	1,024,247	1,797,438	1.78M
Boston	1,786,811	1,661,618	1,782,285	1,950,124	1,060,379	1,956,092	1.70M
Milwaukee	1,360,265	1,608,509	2,397,131	1,978,896	874,292	1,857,408	1.68M
Toronto	2,468,925	2,110,009	1,930,415	1,275,978	755,083	1,400,327	1.66M
Chicago	1,670,075	2,136,988	2,132,821	1,567,787	946,651	1,200,365	1.61M
Oakland	1,334,609	1,353,231	1,294,941	1,735,489	1,304,052	842,259	1.31M
Texas	1,112,461	1,102,391	1,363,469	1,154,432	850,076	1,198,175	1.13M
Minnesota	1,651,935	1,598,463	858,939	921,186	469,090	769,206	1.04M
Seattle	1,127,617	869,574	813,537	1,070,404	636,276	836,204	89M
Cleveland	655,181	734,269	768,941	1,044,021	661,395	1,033,827	82M
Lg. Totals	24,531,457	23,960,053	23,991,053	23,080,449	14,065,986	21,890,052	21.93M

To conserve space and permit easier comparisons, large numbers are sometimes written in a shorthand notation.

Ex. California's average seasonal attendance 1980-1985 is listed at 2.35M which means 2.35 x 1,000,000 = 2,350,000

You should rewrite each of the other **AVG.** figures as in the example:

Calif 2.35M = 2,350,000
N.Y. 2.10M = _____
K.C. 1.96M = _____
Detroit 1.90M = _____
Baltimore 1.78M = _____
Boston 1.70M = _____
Milw.aukee 1.68M = _____

Toronto 1.66M = _____
Chicago 1.61M = _____
Oakland 1.31M = _____
Texas 1.13M = _____
Minnesota 1.04M = _____
Seattle .89M = _____
Clevland .82M = _____

Boston's total attendance for 1985 was 1,786,811 which rounded to the nearest ten thousand is 1,790,000. This is written as 1.79M. Rewrite the other Boston and Seattle figures in the shorthand form (rounding to the nearest ten thousand first).

	1985	1984	1983	1982	1981	1980
Boston	1,786,811	_____	_____	_____	_____	1,956,092
	1.79M	_____	_____	1.95M	_____	_____
Seattle	1,127,617	_____	_____	_____	_____	_____
	_____	_____	_____	_____	.64M	_____

What are three factors other than cable T.V. that could influence the total attendance figures for each team?

EDITOR'S NOTES

TITLE: May Daze!!!

NATURE OF ACTIVITY: Map, problem solving worksheet

OBJECTIVES: To use a map to estimate distances between cities
To solve problems using data from several sources

PRE-SKILLS: Use of a scale, addition of whole numbers

MATERIALS: Ruler, string, map (optional), calendar (given)

NOTES: Team Names (important!!!)

California Angels (actually play in Anaheim, just outside Los Angeles)
Texas Rangers (actually play in Arlington, just outside Dallas)
Minnesota Twins (play in Minneapolis)
Chicago White Sox
Kansas City Royals
Oakland Athletics
Seattle Mariners

Ruler or string can be used to measure distances (scale is approximate) . Boston has not been labeled on map. Students should assume that all flights will be direct ones. They may disagree about the route (straight line distances vs. arcs, etc.), but teacher should allow all reasonable plans as consistency of answers is not a major goal here. Calendar and map could be posted on bulletin board or displayed on overhead projector to minimize the amount of duplicating needed.

FURTHER DISCUSSION / FOLLOW-UP: A way of recording distances can be written on the calendar as team travels from place to place. Activity lends to discussion about geography, time zones, etc. Airline flight schedules can be brought in to plan flights, find costs, etc.

See: Planning the Playoffs, Time After Time.

Students may enjoy finding out more about a 'Frequent Flyer' plan from a major airline. How many miles must they fly to get the free trip to the vacation spot of their choice?

Headline: MAY DAZE !!!

The Red Sox are embarking on two long road trips in the month of May. One trip takes them on a "West Coast Swing" and the other takes them to the Midwest. You are anxious to find out how many miles you will be adding to your "Frequent Flyer" total so you will estimate the distances.

Boston to Chicago	950 *	Los Angeles to Oakland	375
Kansas City	1400	Oakland to Seattle	825
Minneapolis	1250	Chicago to Minneapolis	400
Dallas	1750	Minneapolis to Kansas City	500
Los Angeles	2850	Kansas City to Dallas	550
Oakland	3000		
Seattle	2800		

* ALL ANSWERS ± 25 miles

Using the calendar for May and the distances above, find the miles the Sox will travel:

a) On the "West Coast Swing" between May 3rd and May 15th including the return trip to Boston. 6850

b) On the midwest trip between May 17th and the 31st (when they return to Boston). 4150

c) During the the month of May. 11,000

d) How many miles are saved by going to the West Coast cities on the same trip rather than making separate round trips to each city from Boston?
17,300 - 6850 = 10,450

e) Using the same method you developed to find your estimate for the month of May, how many miles will Wade Boggs travel in a season? more than 100,000? less than 500,000? ~60,000 miles

What effect might the travelling have on the play of the team? Do you think the team looks forward to a road trip? Why or why not? How many miles will you add to your "Frequent Flyer" total?

Headline: MAY DAZE !!!

The Red Sox are embarking on two long road trips in the month of May. One trip takes them on a "West Coast Swing" and the other takes them to the Midwest. You are anxious to find out how many miles you will be adding to your "Frequent Flyer" total so you will estimate the distances.

Boston to Chicago _____
Kansas City _____
Minneapolis _____
Dallas _____
Los Angeles _____
Oakland _____
Seattle _____

Los Angeles to Oakland _____
Oakland to Seattle _____
Chicago to Minneapolis _____
Minneapolis to Kansas City _____
Kansas City to Dallas _____

Using the calendar for May and the distances above, find the miles the Sox will travel:

a) On the "West Coast Swing" between May 3rd and May 15th including the return trip to Boston. _____

b) On the midwest trip between May 17th and the 31st (when they return to Boston). _____

c) During the the month of May. _____

d) How many miles are saved by going to the West Coast cities on the same trip rather than making separate round trips to each city from Boston?
_____

e) Using the same method you developed to find your estimate for the month of May, how many miles will Wade Boggs travel in a season? more than 100,000? less than 500,000? _____

What effect might the travelling have on the play of the team? Do you think the team looks forward to a road trip? Why or why not? How many miles will you add to your "Frequent Flyer" total?

Background on Frequent Flier Programs

The airline business is a very competetive one which requires airlines to do much more than simply advertise in order to attract passengers. (Teacher may ask students to recall familiar airline advertisements, e.g. "Fly the Friendly Skies of United", etc.) The competition to attract those people who fly often, such as many businessmen and women and professional sports teams, is particularly intense. In order to attract these "frequent fliers," airlines offer prizes to passengers based on the number of miles they fly on that particular airline. This rewards frequent fliers for their loyalty which, in turn, helps the airline to fill more seats and make more money.

Attached is a copy of Eastern Airline's Bonus Awards schedule. Below are some sample ticket prices to help students understand the potential value of these awards and why the Red Sox might be interested in calculating the frequent flier miles they would earn on a lengthy trip.

EASTERN AIRLINES
Frequent Traveler
Bonus Awards

40,000 miles	One free Eastern coach ticket or a 75% discount on an Eastern First Class ticket.[1]
50,000 miles	You may select one of the following: a) One free First Class ticket to any Eastern or TWA destination in the continental U.S. or to any Eastern international destination except in South America.[1,8] b) A 50% discount for two on an Eastern Super 7 vacation package.[5]
60,000 miles	A five-year membership in Eastern's Ionosphere Club.[4]
70,000 miles	a) Two free coach class tickets to any Eastern or TWA destination in the continental U.S. or to any Eastern international destination except in South America.[1,8] If you select a destination served by General Rent-a-Car, you may also receive a sub-compact Chevette or similar car for one week.[2] b) One free Eastern coach ticket to any Eastern destination in South America.[10]
80,000 miles	You may select one of the following: a) Two free Eastern coach class tickets to any Eastern or TWA destination in the continental U.S. or to any Eastern international destination except in South America[1,8] and the choice of: 1) A Hertz subcompact Ford Escort or similar car for one week.[2] 2) A free two night/three day weekend stay at any Marriott Hotel.[3] b) One free Eastern First Class ticket to South America, with the purchase of another First Class adult fare companion ticket, same flight and date.[1,6] c) One free First or Business Class British Caledonian ticket to London or SAS ticket to Scandinavia with the purchase of an adult fare companion ticket, same flight, class and date.[7]
90,000 miles	a) Two free First Class tickets to any Eastern or TWA destination in the continental U.S. or to any Eastern international destination except in South America.[1,8] If you select a destination served by General Rent-a-Car, you may also receive a Monte Carlo or similar car for one week.[2] b) One free First Class ticket to any Eastern destination in South America.[10]
100,000 miles	A lifetime membership in Eastern's Ionosphere Club.[4]
110,000 miles	You may select one of the following: a) Two free coach/economy class tickets to any Eastern destination in South America or any TWA international destination.[5,9] b) Two free coach tickets to London on British Caledonian or to Scandinavia on SAS.[7]
140,000 miles	Two free Business Class tickets on British Caledonian to London or on SAS to Scandinavia.[7]
150,000 miles	Two free First Class tickets to any Eastern destination in South America or to any TWA international destination.[5,9]

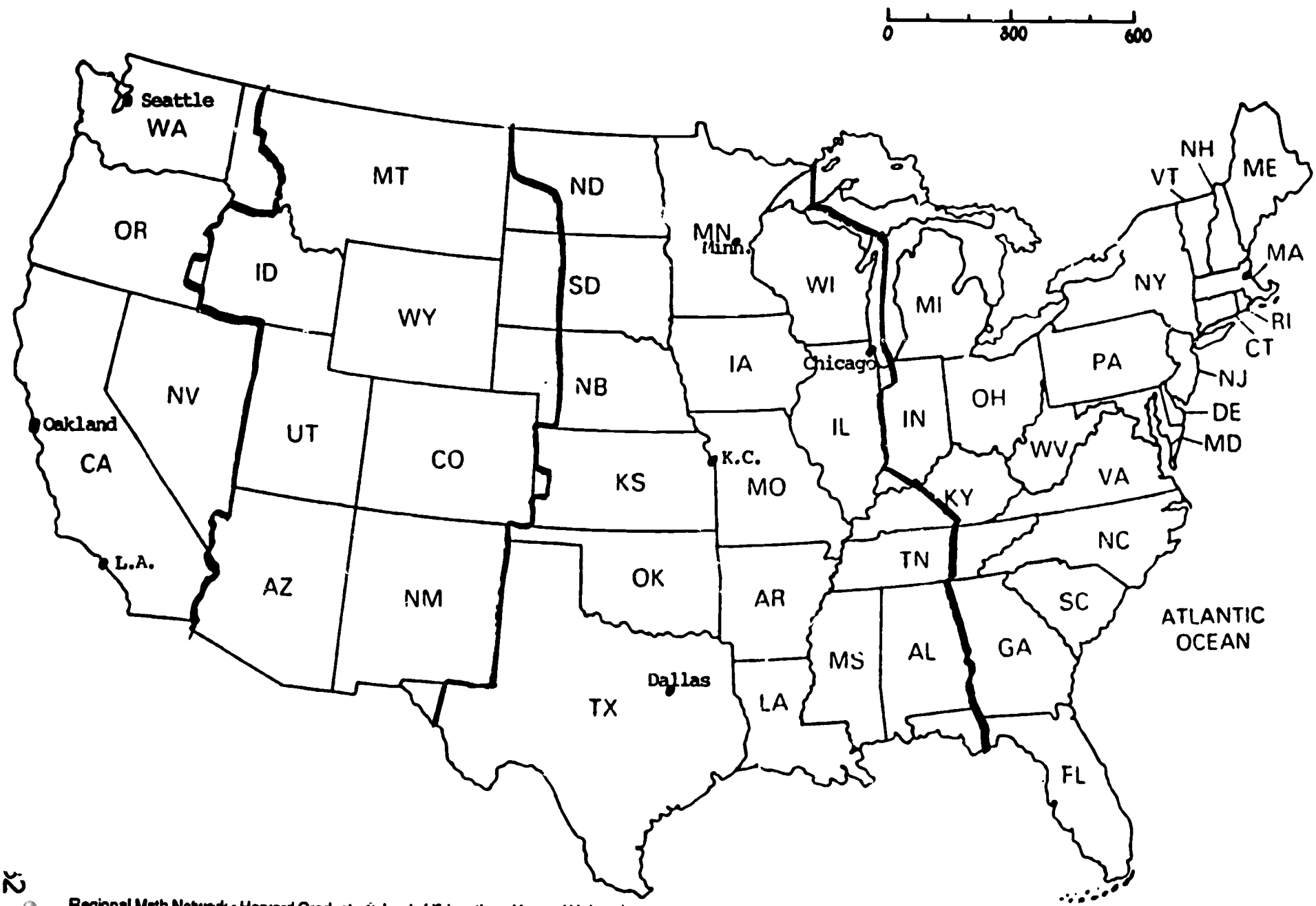
- A first class, one-way ticket from Boston to Los Angeles costs $680.

- A first class, one-way ticket from Boston to London on TWA costs $2,087.

MAY DAZE

SUN	MON	TUES	WED	THUR	FRI	SAT
		BOSTON 1	BOSTON 2	BOSTON 3	CALIFORNIA 4	CALIFORNIA 5
CALIFORNIA 6	OFF 7	OAKLAND 8	OAKLAND 9	OAKLAND 10	SEATTLE 11	SEATTLE 12
SEATTLE 13	OFF 14	BOSTON 15	BOSTON 16	BOSTON 17	CHICAGO 18	CHICAGO 19
CHICAGO 20	MINNESOTA 21	MINNESOTA 22	MINNESOTA 23	OFF 24	KANSAS CITY 25	KANSAS CITY 26
KANSAS CITY 27	TEXAS 28	TEXAS 29	TEXAS 30	BOSTON 31		

Calendar shows game locations



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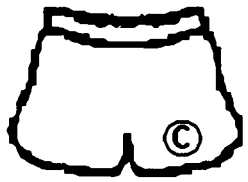
EDITOR'S NOTES



TITLE: Play Ball, Red Sox Ticket Prices **NATURE OF ACTIVITY:** Worksheets (2)

OBJECTIVES: To practice decimal computation (page 1)
To calculate percent increase (page 2)
To solve multiple step story problems

PRE-SKILLS: Computing with decimals (page 1), reducing fractions, converting from fraction to percent, averaging (page 2)

MATERIALS: Calculator

NOTES: This may work nicely as a calculator activity. Play Ball requires no knowledge of %. Red Sox Ticket Prices uses percent of change. Either page can be used independently. Students should be encouraged to do as much mental multiplication as possible (eg. 4 x 8.50 as 4 eights and 4 halves). The equations in #5 of Play Ball require some trial and error. Students might find it easier to organize their trials in a chart form.

Ex. 2 UB + 1 G =
2 UB + 2 G =
2 UB + 3 G =

It may be helpful to think of chart ratios (Red Sox Ticket Prices) in cents for easier reducing. Plan to reinforce "percent of increase" as increase ÷ initial price.

FURTHER DISCUSSION / FOLLOW-UP: Students may wish to research changes in ticket prices for other sports to determine if there is any consistency in percent of increase. Discussion could be raised as to why one team's ticket prices may increase at a higher percentage than another's. This is a good opportunity to discuss other price changes that may reflect "convenience" rather than a specific percent. Examples include soft drinks or candy in vending machines, newspapers and other items where making changes may be an issue

Headline: RED SOX TICKET PRICES

Complete the chart. Round the last column to the nearest whole percent.

TYPE SEAT	1985	1986	$ Increase	RATIO	Reduced Ratio	% of Increase
ROOF	$8.50	$10.00	1.50	1.50/8.50	1.50/8.50 = 3/17	3/17 = 18%
LOWER BOX	$9.50	$11.00	1.50	1.50/9.50	1.50/9.50 = 3/19	3/19 = 16%
UPPER BOX	$8.00	$9.00	1.00	1/8	1/8	1/8 = 13%
RIGHT FIELD BOX	$7.50	$9.00	1.50	1.50/7.50	1.50/7.50 = 1/5	20/100 = 20%
GRANDSTAND	$7.00	$8.00	1.00	1/7	1/7	1/7 = 14%
BLEACHER	$3.00	$4.00	1.00	1/3	1/3	1/3 = 33%

What is the largest dollar increase? 1.50 the smallest? 1.00
What is the largest percent increase? 33% the smallest? 13%
What was the average dollar increase and the average percentage increase from 1985 to 1986?
Dollar increase? $1.25 Percent increase? 19%

Why do you think the greatest percent increase was on the lowest price ticket? Why don't the owners determine just one percent of increase and use it to set ticket prices?

Type of Seat	1985	1986	1987	'85 to '86 % increase	'86 to '87 % increase	'85 to '87 % increase
Lower Box	$9.50	1.00	$14.00	1.50/9.50 = 16%	3/11.00 = 27%	4.5/9.50 = 47%
Grandstand	$7.00	$8.00	$9.00	1/7.00 = 14%	1.00/8.00 = 13%	2.00/7.00 = 29%
Bleacher (at gate)	$3.00	$4.00	$6.00	1.00/3.00 = 33%	2.00/4.00 = 50%	3.00/3.00 = 100%

For any one of the three types of seats above, add the '85 to '86 % increase and the '86 to '87 % increase and compare with the '85 to '87 % increase.

Type of Seat ____ '85 to '86 ____ + '86 to '87 ____ = ____

Why does your answer differ from the '85 to '87 % increase?

Headline: PLAY BALL

The Financial Editor is thinking about a column on the increasing cost of entertainment in the Boston area. He has asked you to analyze Red Sox ticket prices in order to give him some data for his column.

RED SOX TICKET PRICES				
Type Seats		1985	1986	1987
Roof	R	$8.50	$10.00	$12.00
Lower Box	LB	$9.50	$11.00	$14.00
Upper Box	UB	$8.00	$9.00	$11.00
Right Field Box	RFB	$7.50	$9.00	$11.00
Grandstand	G	$7.00	$8.00	$9.00
Bleacher	B	$3.00	$4.00	$5.00* $6.00**

1) How much would you have paid in 1985 for 7 Lower Box Seats? $66.50

2) 5 Roof seats in 1986 cost $7.50 more than in 1985.

(* in advance)
(** at the gate)

3) A family of 3 went to 6 games in 1985, sitting together in a different type of seat each time. What was their total expenditure for tickets?

R 3 x $8.50 = $25.50 RFB 3 x $7.50 = $22.50 Total $130.50
LB 3 x $9.50 = $28.50 G 3 x $7.00 = $21.00
UB 3 x $8.00 = $24.00 B 3 x $3.00 = $9.00

4) Season tickets (all 81 games) for a pair of lower box seats in 1987 would cost $2268.00. This is $729.00 more than the pair cost in 1985.

5) Using abbreviations for the locations, find the number of seats in each equation.

'85 Cost	'86 Cost	'87 Cost
4R	= 2UB + 2 G =	2 UB + 1 R
5G	= 3 RFB + 1G =	2 R+ 1 RFB
6RFB	= 3 LB + 1G + 1B =	1 R+ 1 G+4 B(**)
1 R+1LB + 4 G	= 2RFB + 2G + 3B =	3 R+ 2 B(*)

What would be an appropriate headline for the financial editor to use for his article? Write the first paragraph for that article.

Headline: PLAY BALL

The Financial Editor is thinking about a column on the increasing cost of entertainment in the Boston area. He has asked you to analyze Red Sox ticket prices in order to give him some data for his column.

RED SOX TICKET PRICES			
Type Seats	1985	1986	1987
Roof R	$8.50	$10.00	$12.00
Lower Box LB	$9.50	$11.00	$14.00
Upper Box UB	$8.00	$9.00	$11.00
Right Field Box RFB	$7.50	$9.00	$11.00
Grandstand G	$7.00	$8.00	$9.00
Bleacher B	$3.00	$4.00	$5.00* $6.00**

1) How much would you have paid in 1985 for 7 Lower Box Seats?_____

2) 5 Roof seats in 1986 cost _____ more than in 1985.

(* in advance)
(** at the gate)

3) A family of 3 went to 6 games in 1985, sitting together in a different type of seat each time. What was their total expenditure for tickets?

R 3 x $8.50 = _____ RFB _____ Total _____
LB _____ G _____
UB _____ B _____

4) Season tickets (all 81 games) for a pair of lower box seats in 1987 would cost _____. This is _____ more than the pair cost in 1985.

5) Using abbreviations for the locations, find the number of seats in each equation.

'85 Cost	'86 Cost	'87 Cost
4R	= 2UB + ____ G =	____ UB + ____ R
5G	= ____RFB + 1G=	____R+____RFB
6RFB	= ____LB + 1G + 1B=	____R+____G+4 B(**)
____R + 1LB +____G	= 2RFB + 2G + 3B=	____R+____B(*)

What would be an appropriate headline for the financial editor to use for his article?Write the first paragraph for that article.

Headline: RED SOX TICKET PRICES

Complete the chart. Round the last column to the nearest whole percent.

TYPE SEAT	1985	1986	$ increase	RATIO	Reduced Ratio	% of increase
ROOF	$8.50	$10.00				
LOWER BOX	$9.50	$11.00				
UPPER BOX	$8.00	$9.00				
RIGHT FIELD BOX	$7.50	$9.00	1.50	1.50/7.50	$\frac{1.50}{7.50} = \frac{1}{5}$	$\frac{\quad}{100} = 20\%$
GRANDSTAND	$7.00	$8.00				
BLEACHER	$3.00	$4.00				

What is the largest dollar increase? _____ the smallest? _____
What is the largest percent increase? _____ the smallest? _____
What was the average dollar increase and the average percentage increase from 1985 to 1986?
Dollar increase? _____ Percent increase? _____

Why do you think the greatest percent increase was on the lowest price ticket? Why don't the owners determine just one percent of increase and use it to set ticket prices?

Type of Seat	1985	1986	1987	'85 to '86 % increase	'86 to '87 %increase	'85 to '87 % increase
Lower Box	$9.50	$11.00	$14.00			
Grandstand	$7.00	$8.00	$9.00			
Bleacher (at gate)	$3.00	$4.00	$6.00			

For any one of the three types of seats above, add the '85 to '86 % increase and the '86 to '87 % increase and compare with the '85 to '87 % increase.

Type of Seat	'85 to '86		'86 to '87		
		+		=	

Why does your answer differ from the '85 to '87 % increase?

EDITOR'S NOTES

TITLE: How Embarrassing!!

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To change a fraction to decimal form by dividing or by rewriting with a denominator of 100
To order decimal numbers

PRE-SKILLS: Knowledge that Win-Loss (W-L) Percentage means wins divided by losses not wins divided by total games (winning percentage), division of whole numbers (two digits), ordering of whole numbers, rounding (to thousandths), solving proportions by inspection

MATERIALS: Calculator (optional)

NOTES: Students might enjoy predicting the ranking based on a visual inspection of the ratios. Difficulty in doing this should motivate the use of decimals for comparisons. Students should be encouraged to use the division method as a last resort only. Encourage reducing of ratios before dividing to yield smaller numbers. Proportion method should be stressed where appropriate (eg. 13/50 = ?/100). Having students round to the nearest thousandth by dividing to three places and looking at the size of the fractional remainder will have more meaning than carrying division by 4 places and rounding back. Depending upon the level of student, ties may be ranked as such or division carried further to determine the worst percentage. Discuss the meaning of "worst" in this context. Does the worst percentage necessarily have the fewest wins, the best percentage the most wins, etc.? Note that the players listed are real personalities, but not all are currently playing. Is that the only reason their names may be unfamiliar to students?

FURTHER DISCUSSION / FOLLOW-UP: Students can look up and discuss some of the other "worst records" in sports. (Book of Lists, almanac, record books, etc., are good sources) Gather other sports stats from the newspaper and compute W-L percentages for local teams or individual players. Discuss this different use of the word percentage as naming a three place decimal. The common uses of words like percent and percentage may conflict with the textbook definitions. Compute a few winning percentages (wins divided by total games) to show the difference. (eg. Pearson W-L: 13/50 = .260 Winning percentage: 13/63 = .206) Discuss when the win/loss percentage might be 1.000, 2.000, .500, etc. What would the statistics have to look like? Would the ranking be different if winning percentages were used?

Headline: How Embarrassing !!

The author of an upcoming book (a horror story) about the world's worst professional athletes has hired you as a research assistant. You have decided to look first at the 15 worst pitchers in baseball history. Since the win-loss ratios are all so different, it will be easier to compare them in decimal form.

Find the W-L ratios and percentages, then rank the players in order starting with the worst as #1.

Name	Won	Lost	Ratio	W-L Percentage	Ranking
Jim Hughey	29	80	29/80	.363	6
Happy Townsend	35	81	35/81	.432	7
Buster Brown	48	105	48/105=16/35	.457	9
George Smith	39	81	39/81 = 13/27	.481	10
Hugh Mulcahy	45	89	45/89	.506	12
Rollie Naylor	42	83	42/83	.506	12
Mal Eason	37	71	37/71	.521	15
Jack Nabors	1	24	1/24	.042	1
Joe Harris	4	29	4/29	.138	2
Crazy Schmidt	7	36	7/36	.194	3
Ike Pearson	13	50	13/50	.260	4
John Coleman	23	72	23/72	.319	5
Bob Barr		98	1/2	.500	11
Bill Bailey	34		17/39	.436	8
Gus Dorner		70	18/35	.514	14

Is the W-L percentage the same as the percentage of wins? Give an example to make this clear to your author friend (who is not great with numbers). Has the worst pitcher lost the most games? The best pitcher lost the least?

NO

NO, NO

Bob Barr: Total Games 147
wins 49
win% = 149 ÷ 147 = .33

Headline: How Embarrassing !!

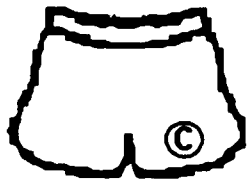
The author of an upcoming book (a horror story) about the world's worst professional athletes has hired you as a research assistant. You have decided to look first at the 15 worst pitchers in baseball history. Since the win-loss ratios are all so different, it will be easier to compare them in decimal form.

Find the W-L ratios and percentages, then rank the players in order starting with the worst as #1.

Name	Won	Lost	Ratio	W-L Percentage	Ranking
Jim Hughey	29	80	29/80	.363	
Happy Townsend	35	81			
Buster Brown	48	105	48/105=16/35		
George Smith	39	81			
Hugh Mulcahy	45	89			
Rollie Naylor	42	83			
Mal Eason	37	71			
Jack Nabors	1	24			
Joe Harris	4	29			
Crazy Schmidt	7	36			
Ike Pearson	13	50	13/50		
John Coleman	23	72			
Bob Barr		98	1/2		
Bill Bailey	34		17/39		
Gus Dorner		70	18/35		

Is the W-L percentage the same as the percentage of wins? Give an example to make this clear to your author friend (who is not great with numbers). Has the worst pitcher lost the most games? The best pitcher lost the least?

EDITOR'S NOTES



TITLE: How does Baseball Really Measure Up?

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To compare decimals and display results on a number line
To practice weight estimation
To estimate quotients of decimals

PRE-SKILLS: Comparing whole numbers, dividing with decimals, locating decimal numbers on a number line, rounding (to tenths).

MATERIALS: Calculator (suggested), display of sports balls (optional)

NOTES: Hand out only page one until ranking exercise is done. Students are to predict what the weight ranking of 10 types of balls will be, and list them in order from lightest to heaviest. Students will then compute the relative weight of each ball using the baseball as a point of reference. They may use a calculator since practicing long division is not a primary objective.

Students will guess at relative weights (to baseball). The scale model may be helpful here. Students will display the computed relative weights along a horizontal number line both in written form and with a picture. Students can then write their articles to respond to "Does Baseball Really Measure Up?"

Teacher or students may set up a display of balls for students to handle and compare before the ranking exercise. Weights listed are actually averages as sports rules usually permit a range of "legal" weights.

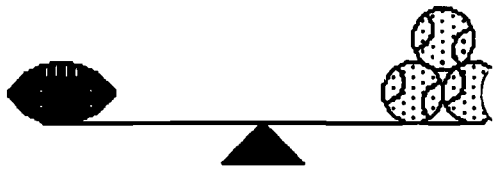
FURTHER DISCUSSION / FOLLOW-UP: Students can also compare volumes of sports balls, length/weight of bats, sticks, etc, dimensions and areas of playing areas, etc. Other types of balls can be added as interest (and information) allows.

Field Hockey Ball 5.625 oz. Lacrosse Ball 5.125 oz.

See Can You Imagine?, Golf Magazine, (Aug. 1986), article on golf balls. Discuss why the baseball might have been selected for the measuring unit. What would the number line look like if the ping-pong ball were used? What about the basketball?

The actual weights are listed below. Since comparing them is difficult, you decide to weigh all the other balls in terms of baseballs.

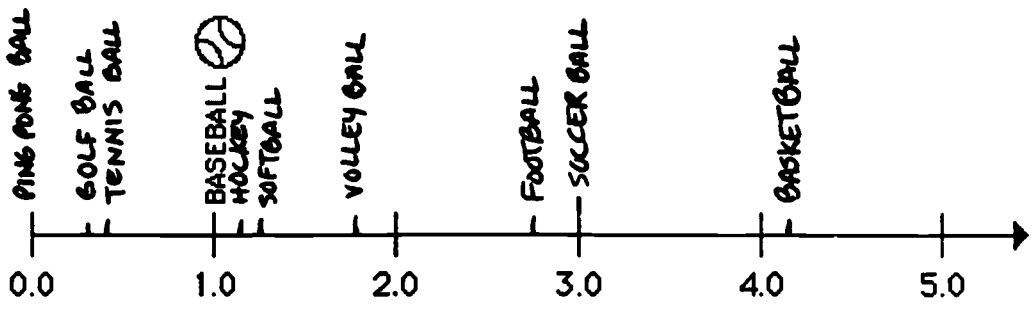
Complete the "guess" column first. Think about how many baseballs would balance each of the others on a scale. You may need to use pieces of baseballs. Either decimal or fractional form is acceptable.



Next calculate the weight in baseballs (to the nearest tenth) and complete the "Calculation" column.

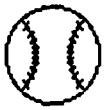
	Actual Ounces	Weight in Number of Baseballs	
		Your Guess	Calculation
Baseball	5.25	1	5.25 ÷ 5.25 = 1
Softball	6.50		6.5 ÷ 5.25 = 1.2
Basketball	22.04		22.04 ÷ 5.25 = 4.2
Ping-Pong Ball	0.088		.088 ÷ 5.25 = .02
Tennis Ball	2.0		2 ÷ 5.25 = .4
Golf Ball	1.62		1.62 ÷ 5.25 = .3
Soccer Ball	16.0		16 + 5.25 = 3.05
Football	14.5		14.5 ÷ 5.25 = 2.8
Volley Ball	9.362		9.362 ÷ 5.25 = 1.8
Hockey Puck	5.75		5.75 ÷ 5.25 = 1.1

You want to present the information to your readers in a clear format, so you will use a number line, listing each ball next to its weight in baseballs and drawing a picture of the ball.



How does the baseball really measure up?

HEADLINE : How Does Baseball Really Measure Up ?



There has been a lot of debate as to how baseball measures up with respect to football, basketball, or many other sports. While some of the other writers are taking surveys of public opinion, your editor wants you to take a more practical approach. You are going to do an article that will literally compare the weight of various balls in sports to the weight of a baseball. You are going to be comparing a baseball with a softball, a basketball, a ping-pong ball, a tennis ball, a golf ball, a soccer ball, a football, a volleyball, and a hockey puck.

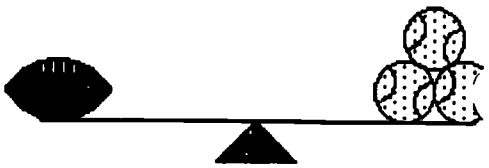
You decide to predict how they will compare by listing the various balls above in order of weight from lightest to heaviest.

		Ranking (Guess)
Lightest	1.	_____
	2.	_____
	3.	_____
	4.	_____
	5.	_____
	6.	_____
	7.	_____
	8.	_____
	9.	_____
Heaviest	10.	_____

How did you make your decisions? Do biggest and heaviest mean the same thing? Is the smallest the lightest?

The actual weights are listed below. Since comparing them is difficult, you decide to weigh all the other balls in terms of baseballs.

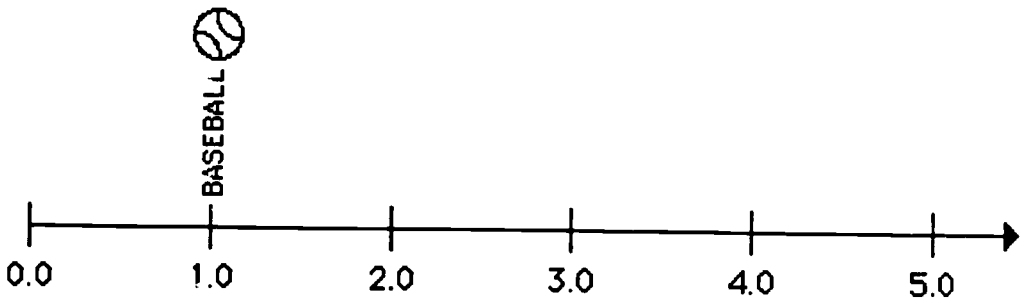
Complete the "guess" column first. Think about how many baseballs would balance each of the others on a scale. You may need to use pieces of baseballs. Either decimal or fractional form is acceptable.



Next calculate the weight in baseballs (to the nearest tenth) and complete the "Calculation" column.

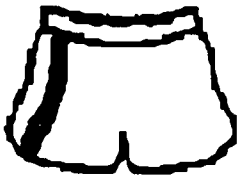
	Actual Ounces	Weight in Number of Baseballs	
		Your Guess	Calculation
Baseball	5.25		
Softball	6.50		
Basketball	22.04		
Ping-Pong Ball	0.088		
Tennis Ball	2.0		
Golf Ball	1.62		
Soccer Ball	16.0		16 ÷ 5.25 =
Football	14.5		
Volley Ball	9.362		
Hockey Puck	5.75		

You want to present the information to your readers in a clear format, so you will use a number line, listing each ball next to its weight in baseballs and drawing a picture of the ball.



How does the baseball really measure up?

Editor's Notes: SCOUTING THE PROS



The Boston Red Sox

The stats sheets for the Red Sox are in both worksheet and grid form. The students are to watch a baseball game on TV for homework or on videotape as a class activity. While watching the game, they are to use the tally sheets or grids* to record the statistics of thier chosen player or players.

After students have completed their stat sheets, they can write a comprehensive article on the game watched, incorporating the statistics gathered.

Students can choose one to three players to record statistics for the number of times at bat, hits, base achieved, put-outs, assists, and errors. Students should use one tally sheet for each player and make the appropriate marks in the proper boxes. Batting percentages for each player can then be computed.

Students may also want to use the Put-out sheet to record Put-Out locations. The diagram on the sheet shows the number code of the locations in Fenway Park. Students can then make slash marks in the appropriate boxes for each inning.

An option to using the tally sheets for locating Put-Outs is to use the grid. Students should record the location of Hits and Put-Outs for each inning. They should use separate grids for each inning or develop another strategy to keep the stats separate. Students can then compare the total number of Put -Outs and Hits at the different locations and analyze that data.

FURTHER DISCUSSION/ FOLLOW-UP: These activities can be used as a lead in to teaching students the scoring techniques used in the Red Sox programs.

Note: If time is limited , students could just watch one or two innings or a specified time such as 15 minutes , 30 minutes, etc.

*When using the grid, remind students to place their symbols in the same area where the play took place.

Red Sox Tally Sheet

Opposing Team: _____ Date: _____

Player: _____ Number: _____ Position: _____

Inning	Times at Bat	Hits	Base	Puts-Outs	Assists	Errors
1						
2						
3						
4						
5						
6						
7						
8						
9						

Totals

Times at Bat _____

Hits _____

Percentage _____

Put-Outs _____

Assists _____

Errors _____

Batting Percentage = $\frac{\text{Hits}}{\text{At Bats}}$ (nearest thousandth)

124

Red Sox Put-Out Sheet

Opposing Team:_____ Date: _____

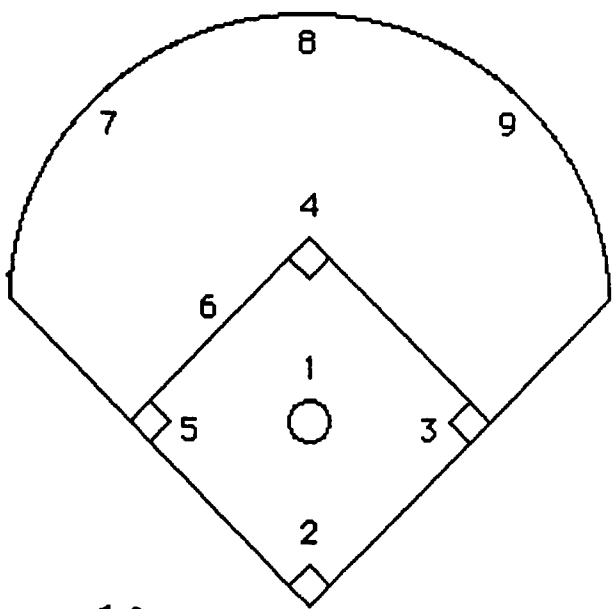
Location of Put-Outs

Inning	1	2	3	4	5	6	7	8	9
1									
2									
3									
4									
5									
6									
7									
8									
9									

Total Put-Outs

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

_____ Total Put-Outs



125

Red Sox Stats

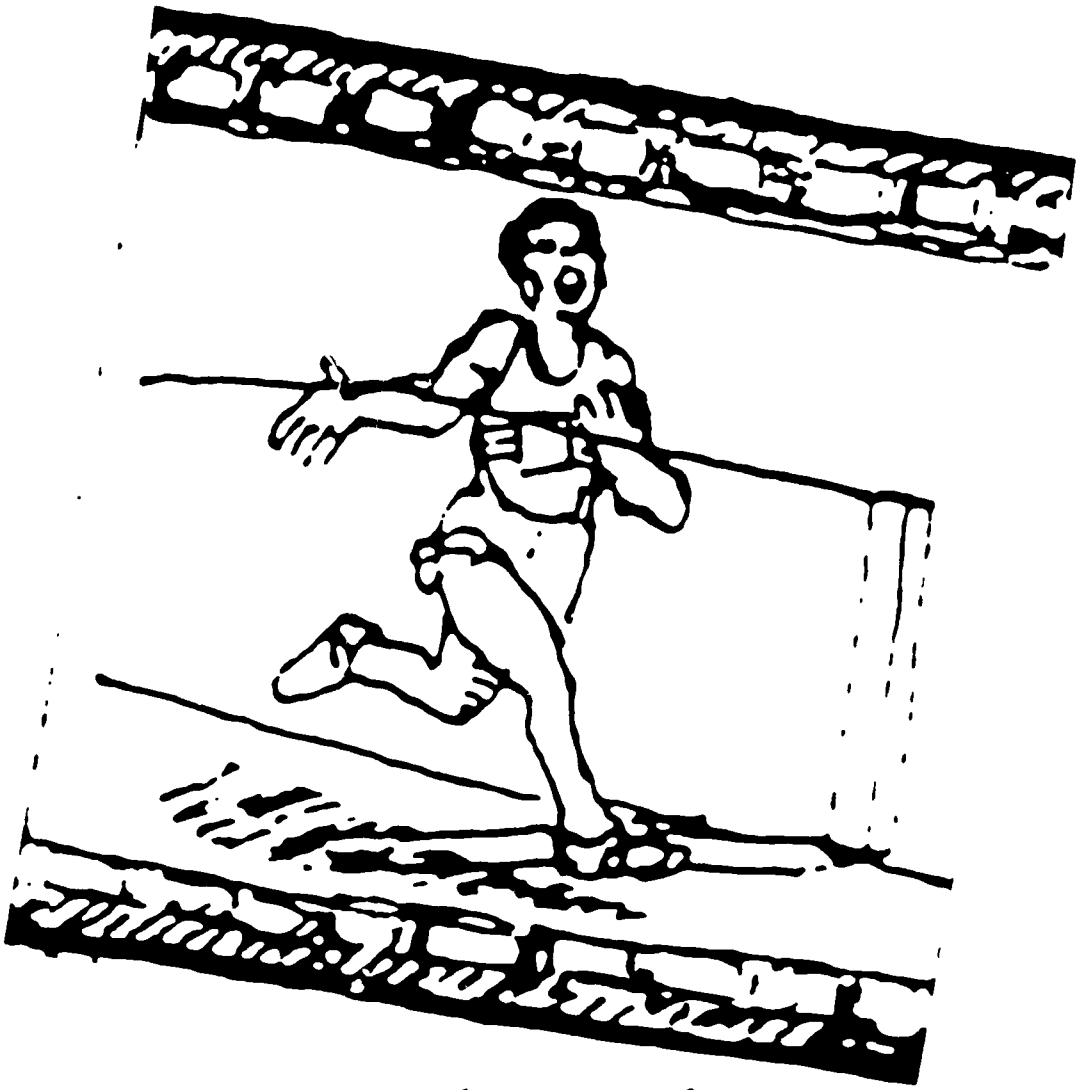
= Location of ball when hit

= Location of Put-Out

126

Inning _____

127



Boston Marathon

Boston Marathon Information

Run on Patriots Day in April - Distance 26 Miles 385 Yards
Start: Hopkinton
Finish: Copley Square, Boston

In 1986, the Boston Marathon went commercial, with John Hancock Financial Services being the corporate sponsor.

1986 BOSTON MARATHON PRIZE STRUCTURE

OPEN DIVISION

Place	Men	Women
1.	$30,000 (+ Mercedes-Benz)	$30,000 (+ Mercedes-Benz)
2.	$20,000	$20,000
3.	$15,000	$15,000
4.	$12,000	$12,000
5.	$10,000	$10,000
6.	$8,500	$8,500
7.	$7,000	$7,000
8.	$5,500	$5,500
9.	$4,000	$4,000
10.	$2,500	$2,500
11.	$1,400	$1,400
12.	$1,300	$1,300
13.	$1,200	$1,200
14.	$1,100	$1,100
15.	$1,000	$1,000
TOTAL	$120,500	$120,500

MASTERS DIVISION

Place	Men	Women
1.	$2,500	$2,500
2.	$1,500	$1,500
3.	$500	$500
TOTAL	$4,500	$4,500

TOTALS	$125,000	$125,000

GRAND TOTAL: $250,000

WHEELCHAIR DIVISION

Place	Men	Women
1.	$2,500	$2,500

Special bonus money of $50,000 for a new world record or $25,000 for a new Boston record is also in the prize structure as well as bonus money for particular fast times:

Men		Women	
under 2 hr. 12 min.	- $1,000 bonus	under 2 hr. 30 min.	- $1,000 bonus
under 2 hr. 11 min.	- $2,000 more	under 2 hr. 28 min.	- $2,000 more
under 2 hr. 10 min.	- $2,500 more	under 2 hr. 26 min.	- $2,000 more

Prior to 1986 the 10 best Boston times were:

1.	2:08:52	Alberto Salazar	United States	1982
2.	2:08:54	Dick Beardsley	United States	1982
3.	2:09:00	Greg Meyer	United States	1983
4.	2:09:26	Toshihiko Seko	Japan	1981
5.	2:09:27	Bill Rodgers	United States	1979
6.	2:09:31	Ron Tabb	United States	1983
7.	2:09:55	Bill Rodgers	United States	1975
8.	2:09:57	Benji Durden	United States	1983
9.	2:10:06	Edward Mendoza	United States	1983
10.	2:10:12	Toshihiko Seko	Japan	1979

BOSTON MARATON - Average of the top 10 times - 2:09:31.9

Wheelchair statistics:

1986	fastest male	1:43:25
	fastest female	2:09:28
1985	fastest male	1:45:34
	fastest female	2:05:26

The Marathon Course

The first 10 miles are easy running. A lot of that stretch is a gentle downhill slope. There are huge crowds cheering runners on -- more people than any other stretch of the marathon.

The first significant hill is 12 miles into the race, just before Wellesley College.

There is a downhill stretch at the 14 to 16 mile point just outside of Wellesley, going into Newton Lower Falls. Strong downhill runners pick up speed here. Most runners find this is their last stretch of the race with good time.

There is a tough rise out of Newton Lower Falls to the route 128 overpass. (The easy part of the race is over).

At about 18 miles, runners begin climbing "Heartbreak Hill" in Newton.

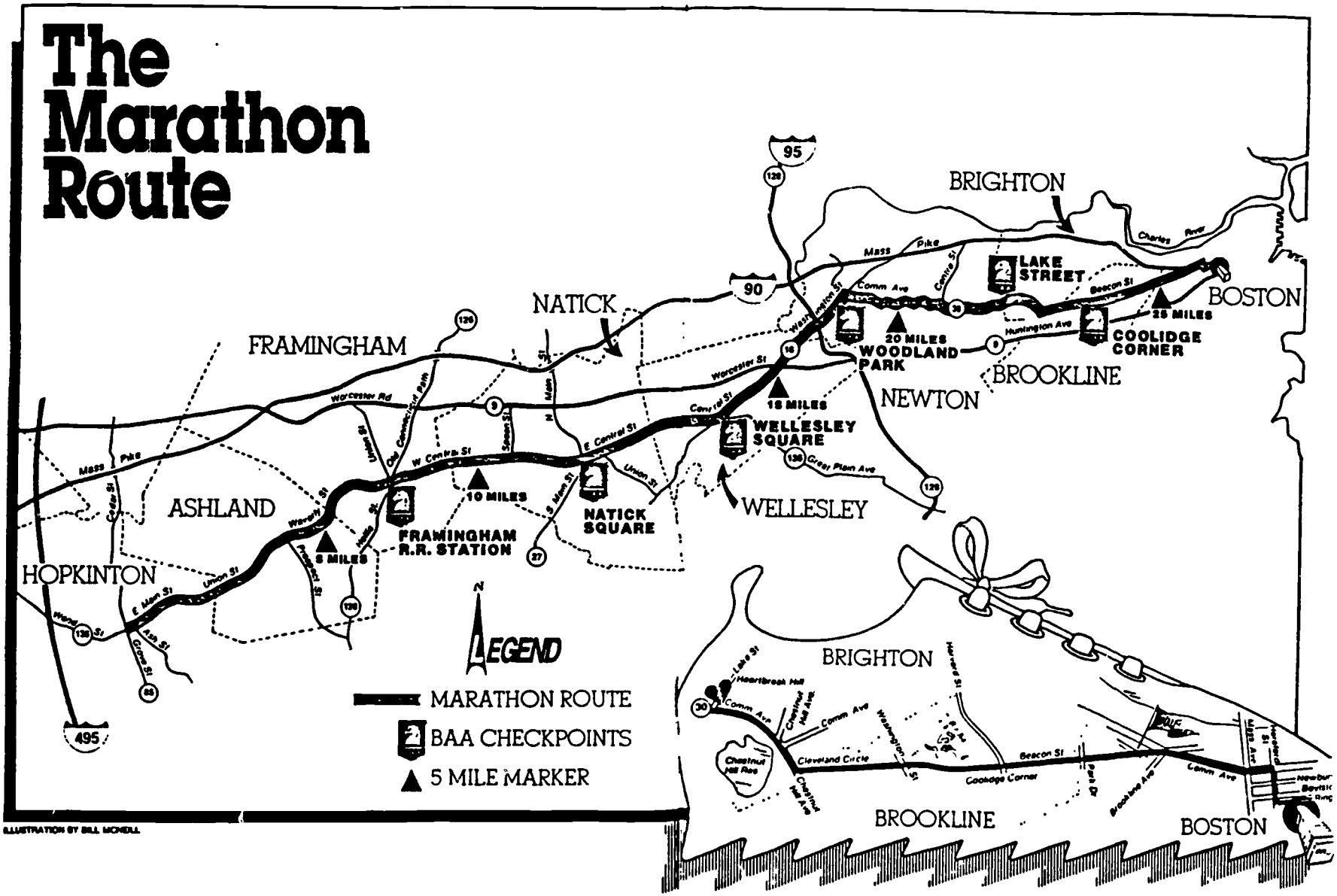
At 20 miles, Heartbreak Hill peaks and the rest of the race is downhill.

The encouragement of the crowds during the last few miles is a real boost to runners.

"Hitting the Wall"

"Hitting the wall" seems to be both a physiological and psychological phenomenon. Physiologically, the body is able to store about 2000 calories-worth of glycogen in the liver and the muscles. Efficient runners burn about 100 calories per mile. At 20 miles, they would have depleted any stored energy. The twenty mile mark occurs just as runners complete the notorious "Heartbreak Hill." Some experience extreme muscle weakness and are unable to finish the race.

Excerpts from "It's a Long Way from Here to There" by Peter Wallan provide additional information.


The Marathon Route
BRIGHTON
NATICK
FRAMINGHAM
NEWTON
BROOKLINE
BOSTON
ASHLAND
HOPKINTON
WELLESLEY
LAKE STREET
COOLIDGE CORNER
WOODLAND PARK
WELLESLEY SQUARE
NATICK SQUARE
FRAMINGHAM R.R. STATION
5 MILES
10 MILES
15 MILES
20 MILES
25 MILES
LEGEND
MARATHON ROUTE
BAA CHECKPOINTS
5 MILE MARKER
ILLUSTRATION BY BILL MCNEILL

■AGE STATISTICS 1985

MALE DISTRIBUTION OF RUNNERS BY AGE

AGE	NO. ENTERED	NO. STARTED	NO. FINISHED	AVGE TIME	PCT. FINISHED
UNDER 20	18	15	13	03:13:39	
20 - 24	267	240	185	03:05:18	
25 - 29	704	634	490	03:02:35	
30 - 34	795	714	562	03:05:59	
35 - 39	647	593	479	03:07:53	
40 - 44	1262	1144	903	03:24:00	
45 - 49	598	555	443	03:26:15	
50 - 54	409	385	281	03:30:13	
55 - 59	141	122	78	03:33:14	
60 & OVER	68	64	38	03:40:16	
TOTALS	4894	4466	3472	03:15:59	

THE AVERAGE RUNNER WAS 38.2 YEARS OLD

FEMALE DISTRIBUTION OF RUNNERS BY AGE

AGE	NO. ENTERED	NO. STARTED	NO. FINISHED	AVGE TIME	PCT. FINISHED
UNDER 20	7	7	6	03:23:50	
20 - 24	76	65	44	03:25:41	
25 - 29	171	155	119	03:26:54	
30 - 34	169	159	112	03:27:08	
35 - 39	125	117	91	03:30:52	
40 - 44	88	88	50	03:37:53	
45 - 49	34	34	25	03:40:31	
50 - 54	22	22	10	03:39:36	
55 - 59	8	8	2	03:36:33	
60 & OVER	1	1	0	00:00:00	
TOTALS	701	656	459	03:29:51	

THE AVERAGE RUNNER WAS 32.8 YEARS OLD

DIVISION RESULTS 1985

MALE 00 TO 39

POS	TIME	NAME	ST/CTRY	AGE
1	2:14:05	SMITH, GEOFF	MA	31
2	2:19:11	TUTTLE, GARY R	CA	37
3	2:21:15	HELGESTON, MARK M	OH	27
4	2:21:29	SUPINO, LOU	CO	30
5	2:21:31	DOYLE, BOBBY	MA	36
6	2:23:35	MIMURA, TORU	JAPAN	22
7	2:23:35	HEWES, CHARLES	NH	29
8	2:23:50	DILLON, DANIEL A	MA	27
9	2:24:29	FLETCHER, CHRISTOPHER	FL	27
10	2:25:23	BLAIR, NORMAN W	NC	27
11	2:25:36	DYSON, RANDALL L	TX	32
12	2:26:22	AMWAY, MARK A	PA	24
13	2:26:59	JACOB, WAYNE A	CT	30
14	2:26:59	SLAVIN, MICHAEL M	MA	25
15	2:27:04	GRYGIEL, STEPHEN G	MA	27

FEMALE 00 TO 39

POS	TIME	NAME	ST/CTRY	AGE
1	2:34:06	LARSEN-WEIDENBACH, LISA	MA	23
2	2:42:15	HUNTINGTON, LYNNE	TX	34
3	2:42:27	DUNN, KAREN E	NH	22
4	2:43:47	BUTTERFIELD, DEBORAH L	BERMUDA	33
5	2:46:33	SMITH, VICKIE C	TX	29
6	2:46:43	NORTHROP, KATHLEEN P	NH	34
7	2:46:51	MOODY, KIMBERLY A	ME	29
8	2:48:57	HYNES, MARY P	MA	30
9	2:50:16	BULMAN, ELIZABETH M	MO	25
10	2:50:36	DILLINGER, BETH	VA	29
11	2:52:42	WASSIK, PATRICIA M	CO	27
12	2:53:33	LUPICA, SUSAN F	MA	31
13	2:53:35	ANDREW, CARYL E	NY	24
14	2:55:34	LANGLAIS, SHERRY	GA	30
15	2:55:38	NELSON, BETTY H	IN	39

MALE 40 TO 49

POS	TIME	NAME	ST/CTRY	AGE
27	2:29:34	MCGUIRE, JOSEPH H	CANADA	41
44	2:31:56	FALLON, COLIN W	AUSTRALIA	44
63	2:33:52	GOFORTH, HAL W	CA	48
66	2:33:56	FOLEY, J GUS	MA	42
86	2:35:55	KUHA, JOUKO S	FINLAND	45
107	2:37:17	SKINNER, TOBY E	OR	48
114	2:37:43	JEFFERS, PETER M	NY	45
116	2:37:58	WHITE, DOUG	DE	42
120	2:38:15	BEISEL, JACK T	AL	47
125	2:38:24	SCOTT, DENNIS C	OH	41
139	2:39:14	SIMPSON, DICKIEJOE	OH	45
143	2:39:46	WILLIAMS, ANTHONY	ENGLAND	43
148	2:39:47	JONES, WAYNE C	TX	48
154	2:39:58	JAMBORSKY, RICHARD J	VA	48
169	2:40:51	DYER, BENJAMIN C	VA	42

FEMALE 40 TO 49

POS	TIME	NAME	ST/CTRY	AGE
57	3:10:56	WALTERS, HAROLENE	CA	42
64	3:12:16	MCDONALD, DONNA M	MA	48
77	3:14:47	JOHNSON, VICKI M	TN	42
82	3:15:39	DOTY, CAROLYN	CA	42
101	3:17:36	LEITER, EVELYN L	IN	46
122	3:19:51	RODE, GANIA	MI	43
135	3:21:12	TATHALL, JOAN C	PA	41
154	3:22:42	HANGER, WENDI	CANADA	47
159	3:23:10	KENNARD, MARY A	TX	45
161	3:23:17	PHILLIPS, VIOLA S	CA	45
162	3:23:18	HIGGINS, DARLENE R	ME	44
170	3:24:27	COOPER, SHARON	OK	46
174	3:24:52	DIZEREGA, FAY M	OK	42
175	3:24:58	CESAL, BARBARA E	IL	40
179	3:25:27	HATCH, ANDREA J	MA	41

MALE 50 TO 59

POS	TIME	NAME	ST/CTRY	AGE
95	2:36:26	FOULK, WILLIAM B	NH	51
308	2:46:22	SULLIVAN, JOHN L	MA	53
358	2:47:59	CARTER, ROBERT M	CA	54
361	2:48:02	HYSER, BEN L	PA	50
404	2:48:53	SPRATT, BRENDAN J	FL	51
456	2:49:44	SULLIVAN, MICHAEL J	MA	55
636	2:54:31	LOPES, MANUEL JOSE	CANADA	55
652	2:54:57	GRAHAM, JOHN	WA	52
662	2:55:08	STURDEVANT, JAY W	CT	54
727	2:56:36	BRADLEY, EARL G	OH	51
732	2:56:48	YAMANAKA, JIM SUNAO	GA	52
753	2:57:03	STEFFENSEN, CLAYTON C	CA	51
766	2:57:20	JONES, KENNETH J	NY	54
778	2:57:37	BROCK, BOB	NY	52
811	2:58:13	SNOW, BERNARD	CT	53

FEMALE 50 TO 59

POS	TIME	NAME	ST/CTRY	AGE
29	3:03:47	ISHIGAMI, MIYO	JAPAN	58
74	3:14:34	GLASSMAN, JANET	PA	56
192	3:27:05	YU, WENSHI	NY	50
199	3:27:58	JENSEN, LOIS	CO	50
268	3:34:48	ROBINSON, BARBARA V	MA	51
339	3:41:26	LAMPE, BEVERLY D	WI	53
387	3:47:24	OLCESE, JEAN L	PA	50
392	3:47:50	SMITH, BEVERLY V	MA	50
428	3:52:17	STONER, BETTY A	WY	52
436	3:54:15	TICKNER, NATALIE H	CT	51
452	3:58:33	KOSEKI, MIYOKO	JAPAN	59
455	3:59:15	KEBEBRAND, AGATHA	GA	51

THE LAW OF AVERAGES

	1985	1984	1983
NUMBER OF ENTRANTS	5595	6924	6674
NUMBER OF STARTERS	5122	6164	6070
MEN	4466	5424	5415
WOMEN	656	740	655
WHEELCHAIR	25	22	26
NEW ENGLAND	1370	1417	1419
OTHER U.S.	3364	4318	4312
FOREIGN	388	429	339
NUMBER OF FINISHERS (%)	3931 (76.7%)	5290 (85.8%)	5388 (88.7%)
MEN (%)	3472 (77.7%)	4708 (86.7%)	4833 (89.2%)
WOMEN (%)	459 (69.9%)	582 (78.6%)	555 (84.7%)
WHEELCHAIR (%)	24 (96%)	19 (86.4%)	26 (100%)
AVERAGE TIME	3:17:36	3:05:05	3:02:01
MEN	3:15:59	3:02:56	2:59:51
WOMEN	3:29:51	3:22:30	3:20:57
MEN UNDER 20	3:13:39	2:48:34	2:49:15
WOMEN UNDER 20	3:23:50	3:16:29	3:29:40
MEN 20-24	3:05:18	2:47:48	2:44:21
WOMEN 20-24	3:25:41	3:17:50	3:13:42
MEN 25-29	3:02:35	2:49:00	2:46:41
WOMEN 25-29	3:26:54	3:17:11	3:17:41
MEN 30-34	3:05:59	2:53:44	2:51:11
WOMEN 30-34	3:27:08	3:19:56	3:19:46
MEN 35-39	3:07:53	2:55:39	2:53:19
WOMEN 35-39	3:30:52	3:24:32	3:21:10
MEN 40-44	3:24:00	3:12:28	3:09:31
WOMEN 40-44	3:37:53	3:32:23	3:30:55
MEN 45-49	3:26:15	3:13:36	3:10:40
WOMEN 45-49	3:40:3	3:32:04	3:30:46
MEN 50-54	3:30:13	3:22:32	3:20:18
WOMEN 50-54	3:39:36	3:37:19	3:33:16
MEN 55-59	3:33:14	3:25:19	3:22:28
WOMEN 55-59	3:36:33	3:35:57	3:43:52
MEN 60 & OVER	3:40:16	3:30:40	3:32:04
WOMEN 60 & OVER	0:00:00	0:00:00	3:49:07

From: BOSTON MARATHON OFFICIAL PROGRAM 1986

How to qualify for the Boston Marathon

Boston Marathoners in 1977: no weekend joggers, please

PHOTO BY BILL DICKINSON

Before you load up on carbohydrates, lace up your running shoes, and hitch a ride out to Hopkinton for the 90th running of America's oldest marathon, think again. There may be an ocean of runners stepping lightly through the Massachusetts countryside, but none of them is a casual weekend jogger. Each participant is a committed athlete who has earned a position in the celebrated race.

The first requirement for participation in the Boston Marathon is that a runner must be at least 18 by the day of the event. Runners must also have registered with The Athletics Congress (TAC), the Indianapolis-based governing body for this country's road races and track and field events. Registration is simple: you fill out an application form, pay the $6 entry fee, and request a TAC number. The Boston Athletic Association (BAA), which sponsors the Boston Marathon, requires an additional $10 fee.

Thus ends the paperwork. To be considered for participation in this year's race, a runner must have entered and finished a TAC-certified marathon sometime between April 15, 1985, and March 23, 1986. The group sanctions more than 100 such races throughout the US each year. Entry in a foreign marathon also qualifies a runner for the Boston race as long as the marathon was certified by that country's equivalent of TAC.

Runners must also have completed a previous marathon in a certain minimum time, determined by the BAA. These requirements are: 2:50 or less (that's hours: minutes) for men under 40 years old; 3:10 or better for men 40 to 49; 3:20 or less for men 50 to 59; and 3:30 or less for men 60 and older. Women under 40 years must do 3:20 or better to qualify; women between 40 and 49 must finish in 3:30 or less; women 50 to 59 must complete the course in 3:40 or better; and women 60 and older must run 3:50 or less. The wheelchair division breaks down its qualifying times into five classes, depending upon the disability of the entrant, with maximum finishing time ranging from 2:20 to 3:00.

The marathon event commemorates the messenger who in 490 BC ran to Athens on the Plains of Marathon to bring news of the Greek victory over the Persians. He ran roughly 25 miles, and the modern race has been set at 26 miles and 385 yards, to the angstrom. Only marathons of this distance will be accepted for qualifying times by the BAA. Thus, if you need a minimum qualifying time of 2:50, you'll have to log an average mile pace of 6:29 (that's minutes: seconds). If you need a time of 3:10, you must average a 7:15 mile. A 3:20 requirement calls for a 7:38 mile, and a 3:30 demands an 8:01 mile.

If you are a previous winner of the Boston Marathon, congratulations; you can forget the paperwork and restrictions because you are qualified for life. Past winners running this year include Bill Rodgers, Greg Meyer, Lisa Larsen Weidenbach, Lorraine Moller, and the perennial favorite, Johnny Kelley Sr., who won his first Boston Marathon half a century ago.

The BAA also sends out personal invitations to those it considers to be prominent world-class runners. This year 300 such invitations went out, a small percentage of which went to runners who've never before run a marathon but who've earned the attention of the world running community by completing 10K runs in less than 29 minutes.

If you're a bit winded from just reading these requirements, don't worry. The Boston Marathon is really just a great excuse for a 26-mile-long street party. So get yourself a nice spot on the sidelines, pop open a drink, and cheer on the ambitions of some 6000 truly special athletes.

— James Daly

From: BOSTON MARATHON OFFICIAL PROGRAM 1986

EDITOR'S NOTES

TITLE: What's the Problem at the Boston Marathon

NATURE OF ACTIVITY: Problem Posing

OBJECTIVES: To formulate word problems
To identify relevant data in a problem solving situation
To choose appropriate problem solving strategies

PRE-SKILLS: Some problem solving experience

MATERIALS: Fact sheets (see Press Kit), brochures, flyers, etc. about facility (optional)

NOTES: This activity requires students to focus on the facts in a problem situation as well as on the question and solution. Discuss "fact" sources other than those in the teacher packet (Press Kit). Students may be able to bring in program books, brochures, etc. or have information from personal trips, T.V. viewing, etc. To start the thinking process, choose one or two pieces of data and have students brainstorm to produce possible questions. Focus on fluency first, then select those questions that can be solved with the students' background in mathematics. Discuss the kinds of questions that could be asked: How many? How much more? What fraction? What percent? How many ways? What's the least? Etc.

Encourage questions that require varied strategies such as single computation, multiple computations, sketching, efficient counting, chart or list, etc. Plain paper may be used so the number of problems is not limited to five. Students may fold over the solution column so that problems can be posted or exchanged for sharing.

FACTS	SAMPLE QUESTIONS	SOLUTION
The Boston Marathon had 6674 entrants in '83, 6924 in '84, and 5595 is '85.	What is the average number of entrants over the three year period? (nearest whole number)	6674 6924 + 5595 19193 $6397\ 2/3$ $3\overline{)19193}$ 6398 Entrants

FURTHER DISCUSSION / FOLLOW-UP: Put some constraints on the kinds of questions that can be used. For example:

Must involve more than one operation for solution.
Must involve a particular operation (s).
Must involve a percent or decimal.
Must have extraneous data among facts.

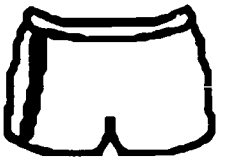
This can be used as a bulletin board activity where the teacher posts one or more facts on a regular basis and students contribute questions (and solutions). Plan a fact or data gathering field trip to the Boston Marathon. The problems generated could be put on 3 X 5 cards (with answers on the back) to become a problem solving deck. See other What's the Problem at _____ activities.

Headline: What's the Problem at the Boston Marathon?

The Harvard Regional Math Network has asked your editor to suggest some problem solving activities that are related to sports. Guess who was assigned this challenge! You must use your resource file (as well as your memory) for facts to make up some sample problems that other students might enjoy. Record your problems in your reporter's notebook using the following headings:

FACTS	QUESTION(S)	SOLUTION(S)

EDITOR'S NOTES



TITLE: The Boston Marathon: How Do You Qualify?

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To locate relevant data in a chart
To compute with time (+, -)

PRE-SKILLS: Familiarity with hrs:min:sec notation and equivalences, subtraction with regrouping

MATERIALS: None

NOTES: The teacher may want to review hrs:min:sec notation. Students need to understand the reason for the time adjustment factor (the large number of entrants means that the higher numbers will not even get to the starting line for several minutes). Students may be familiar with the term "seed" (a somewhat subjective way of ranking participants) from sports such as tennis, college basketball, etc. Review subtraction with regrouping using hundreds-tens-ones as a starting point for subtracting with hrs:min:sec (note that if 1 min is borrowed, this is really 60 sec to be added to the existing seconds). The first two pages may be posted or displayed on the overhead rather than distributed individually to minimize the amount of duplication.

FURTHER DISCUSSION / FOLLOW-UP: Discuss the many reasons beyond just strict qualifying times for the varying participation in the Boston Marathon (role of prize money, other marathons, weather, route, etc.) Students may be interested in simulating their own qualifying. Using stopwatch and measured mile, they might run one mile and multiply that time by 26 as an estimate for their qualifying trial (use seconds, then convert). Assume that they would be seeded in the last group. What would be a reasonable set of standards for kids (consider different age categories, male vs. female). Discuss the age chart; why is "under 40" such a wide range? This is a good chance to get student opinions about age differences for various other sports. What are prime ages in basketball, hockey, tennis, etc? What evidence can you give? See Vive La Difference!, Am I There Yet?, Winning Women, as well as the Marathon Fact Sheets.

COMPUTATION OF RUNNER'S QUALIFYING TIME (HOURS:MINUTES:SECONDS)	NAME	NUMBER	STATE OR COUNTRY	AGE	SEX	BAA QUALIFYING STANDARDS FOR 1987	DOES RUNNER QUALIFY FOR 1987?
SEED [7] 3:~~10~~:~~33~~ 9:99 − 0:01:45 = 3:08:54	WILDA, FRANK J.	5205	MA	40	M	3:10:00	YES
SEED [5] 3:11:08 − :01:05 = 3:10:03	RENCOURT, BEN G.	1538	TX	33	M	3:00:00	NO
SEED [5] 3:11:10 − :01:05 = 3:10:05	NICHOLS, JR. JULIAN	1541	CT	38	M	3:00:00	NO
SEED [10] 3:11:10 − :03:00 = 3:08:10	WIEBER, GARY H.	6132	MN	40	M	3:10:00	YES
SEED [12] 3:11:11 − :02:10 = 3:09:01	BUNDY, JR. STEPHEN A.	5334	NC	42	M	3:10:00	YES
SEED [7] 3:12:~~13~~ 0:13 − :01:45 = 3:09:28	GREEN ROBERT J.	5167	CANADA	46	M	3:10:00	YES

COMPUTATION OF RUNNER'S QUALIFYING TIME	NAME	NUMBER	STATE OR COUNTRY	AGE	SEX	BAA QUALIFYING STANDARDS FOR 1987	DOES RUNNER QUALIFY FOR 1987?
SEED [3] 3:~~11~~:~~16~~ 10:39 − :00:30 = 3:10:46	GREEN, LAWRENCE A.	898	WI	38	M	3:00:00	NO
SEED [10] 3:11:16 − :3:00 = 3:08:16	MILLER, THOMAS S.	6269	VT	43	M	3:10:00	YES
SEED [5] 3:11:16 − :1:05 = 3:10:11	MANN, EVERETT C.	4394	OH	40	M	3:10:00	NO
SEED [7] 3:~~11~~:~~02~~ 10:37 − :1:45 = 3:09:36	BORGLUND, ROBERT E.	4939	MA	57	M	3:20:00	YES
SEED [8] 3:11:22 − :2:10 = 3:09:12	KING, MARTY	5363	NY	45	M	3:10:00	YES
SEED [7] 3:~~11~~:~~27~~ 10:37 − :1:45 = 3:09:42	STABNO, JAN W.	4878	WEST GERMANY	40	M	3:10:00	YES

10 A

Headline: THE BOSTON MARATHON: HOW DO YOU QUALIFY?

The Boston Marathon is only a few weeks away. You are to write an article to inform your readers of the Boston Athletic Association's qualifying requirements.

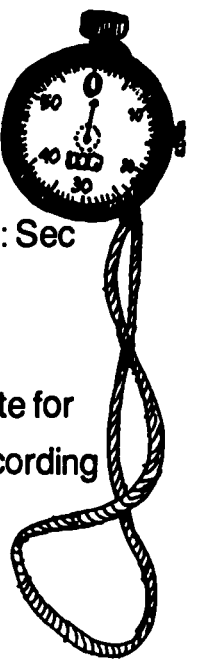
The Boston Marathon is the only marathon outside the Olympic Trials which requires a time standard for entry. To have qualified as an official entrant in the 1986 marathon, you were required to have finished a TAC (The Athletic Congress) certified marathon sometime between April 15, 1985 and March 23, 1986 with a minimum time requirement. Not all official runners in the Boston Marathon do well enough to qualify for the next year's Boston Marathon. Many people run the Marathon route as unofficial participants.

In gathering information from the BAA, you have learned that several factors must be considered in determining if a runner's time qualifies him/her for the following year -- the runner's seed, sex, and age. So you can better understand the qualifing process, you are going to check the times of a few runners from the 1986 marathon.

Minimum qualifying times for the 1987 Boston Marathon (BAA Standards):

Ages	Times for Men	Times for Women
under 40	3:00:00	3:30:00
40-49	3:10:00	3:40:00
50-59	3:20:00	3:50:00
60 or older	3:30:00	4:00:00

Hrs : Min : Sec



Also included on the following page is 1986 time adjustments to compensate for the time it took runners to cross the starting line. Runners are "seeded" according to their number.

HEADLINE: THE BOSTON MARATHON: How Do You Qualify?

As you are screening the information for each entrant, you should:

1. Determine the runner's seed and time adjustment.
2. Subtract the time adjustment from the computer time which is given.
3. Check the runner's age and sex and determine the appropriate minimum BAA qualifing time from the chart.
4. Compare the runner's adjusted time with the BAA standards. Does the runner's time qualify him/her for the 1987 marathon?

1986 B.A.A. BOSTON MARATHON TIME ADJUSTMENTS*

SEED	RUNNER NUMBER			TIME ADJUSTMENT
1	0001-0139	4001-4020	F 001- F 022	0 sec.
2	0140-0570	4021-4077	F 023- F 033	15 sec.
3	0571-0984	4078-4133	F 034- F 054 W 001- W 010	30 sec.
4	0985-0999 1006-1404	4134-4201	F 055- F 061	45 sec.
5	1405-1668	4202-4414	F 062- F 075	1 min. 5 sec
6	1669-1719	4415-4815	F 076- F 110 W 011- W 022	1 min. 25 sec.
7	1720-1734	4816-5266	F 111- F 139 W 023- W 026	1 min. 45 sec.
8	1000-1005 1735-1769	5267-5638	F 140- F 212 W 027- W 034	2 min. 10 sec.
9	1770-1788	5639-5929	F 213- F 401 W 035- W 055	2 min. 35 sec.
10	1789-	5930-	F 402- W 056-	3 min.
	Men's Open	Men's Masters	F Women's Open W Women's Master's	

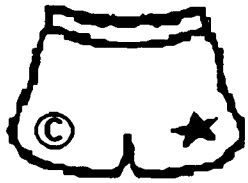
* These time adjustments compensate for the amount of time it took the successively seeded runners to cross the starting line.

Suggest some ways the BAA standards might be changed to encourage more participants or to be fairer to different age groups. (The BAA has already eased 1987 standards by 10 minutes for males under 40 and for females in all age groups). This was done in response to the smaller number of entrants. The 1986 marathon had 4,850 official entrants, the lowest number since 1978.

COMPUTATION OF RUNNER'S QUALIFYING TIME (HOURS:MINUTES:SECONDS)	NAME	NUMBER	STATE OR COUNTRY	AGE	SEX	BAA QUALIFYING STANDARDS FOR 1987	DOES RUNNER QUALIFY FOR 1987?
SEED [7] 3:~~10~~ 9:99 :~~39~~ − 0:01:45 = 3:08:54	WILDA, FRANK J.	5205	MA	40	M	3:10:00	YES
SEED [ ] 3:11:08 − : : = : :	RENCOURT, BEN G.	1538	TX	33	M		
SEED [ ] 3:11:10 − : : = : :	NICHOLS, JR. JULIAN	1541	CT	38	M		
SEED [ ] 3:11:10 − : : = : :	WIEBER, GARY H.	6132	MN	40	M		
SEED [ ] 3:11:11 − : : = : :	BUNDY, JR. STEPHEN A.	5334	NC	42	M		
SEED [ ] 3:11:13 − : : = : :	GREEN ROBERT J.	5167	CANADA	46	M		

COMPUTATION OF RUNNER'S QUALIFYING TIME	NAME	NUMBER	STATE OR COUNTRY	AGE	SEX	BAA QUALIFYING STANDARDS FOR 1987	DOES RUNNER QUALIFY FOR 1987?
SEED ☐ 3:11:16 - : : ____ : :	GREEN, LAWRENCE A.	898	WI	38	M		
SEED ☐ 3:11:16 - : : ____ : :	MILLER, THOMAS S.	6269	VT	43	M		
SEED ☐ 3:11:16 - : : ____ : :	MANN, EVERETT C.	4394	OH	40	M		
SEED ☐ 3:11:21 - : : ____ : :	BORGLUND, ROBERT E.	4939	MA	57	M		
SEED ☐ 3:11:22 - : : ____ : :	KING, MARTY	5363	NY	45	M		
SEED ☐ 3:11:27 - : : ____ : :	STABNO, JAN W.	4878	WEST GERMANY	40	M		

EDITOR'S NOTES



TITLE: The Boston Marathon's Winning Women

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To compute average minutes/mile for three Boston Marathon winners
To change yards to miles and convert to decimal form
To change hours to minutes, seconds to minutes, and convert to decimal form
To compute percents
To compare and interpret statistics

PRE-SKILLS: Fraction to decimal to percent conversions, addition, subtraction, and division of decimals, calculating percents

MATERIALS: Calculator

NOTES: The first page might be done as a class activity using the overhead or blackboard. The teacher may wish to work out some calculations with students and check charts as students are working. The teacher may prefer to alter the procedure for calculating "Time from last checkpoint" suggested by the organization of the chart. (The chart suggests you change the checkpoint times to decimal form and then subtract the decimal times to get "Time from last checkpoint.") Although not the most accurate method, it has been suggested for the sake of simplicity. With more capable students, the teacher may choose to eliminate the use of the decimal times in the first column. Students could instead subtract the original times in min:sec form, and then convert that difference to decimal form. Students may need reinforcement concerning the min/mile notation as min. per mile.

FURTHER DISCUSSION / FOLLOW-UP: Discussion of findings is very important after the students have completed charts and all calculations. Students may wish to write articles about their findings or research other Boston Marathon runners. As part of the discussion it may be useful to discuss the nature of the course itself and how each runner responded to the terrain and the distances already completed. Using a map or even a simple diagram to mark the checkpoints and label terrain features relative to those checkpoints may be helpful. The earlier description gleaned from an article about the course, "It's a Long Way From Here to There," by Peter Wallan may help students to visualize the course. Note Marathon Fact Sheet.

Headline: THE BOSTON MARATHON'S WINNING WOMEN

Because of the current interest in women's athletic achievements, you want to write a feature article on female winners of the Boston Marathon. You have set up interviews with Joan Benoit (holder of current course record, 2:22:43, set in 1983) and Ingrid Kristiansen (first place female in 1985). Being a good investigative reporter, you will do some "homework" before interviewing them. Using official checkpoint times, you can see how they paced themselves, so you can ask intelligent questions and get the most out of the interviews. One big and looming question is "Do the winning males and females run different style races?" The only male course records available were those from 1986 winner, Rob DeCastella. Using this information, what generalizations will you be able to make about winning females?

Before you begin your calculations, you need to know how to change 26 miles 385 yards to a decimal numeral representing miles.

1 mile = 5280 feet or 1760 yards.

385 yards is what part of a mile? $\frac{385}{1760}$ (fraction) $\frac{y}{}$ = .22 (decimal, rounded to hundredths)

So now, 26 miles 385 yards = 26.22 miles

You also need to know how to change time represented as hours:minutes:seconds to a decimal numeral representing minutes.

Let's look at 2:22:43 2 hours = 120 minutes.

43 seconds is what part of a minute? $\frac{43}{60}$ (fraction) = .72 (decimal, rounded to hundredths)

So ..... 2:22:43 equals

120.00 min
22.00 min
+ .72 min
142.72 min

Or 2:22:43 = 142.72 min

JOAN BENOIT

Checkpoint	Time Hr : Min : Sec	Accumulated Time in mins. (hundredths)	Time from last checkpoint (hundredths)	% of total time from last checkpoint (tenths)	min / mile since last checkpoint (hundredths)
5 Miles	0:26:11	26.18	26.18	18.3%	5.24
10 Miles	0:51:38	51.63 min.	25.45	17.8 %	5.09
15 Miles	1:18:56	78.93	27.30	19.1 %	5.46
20 Miles	1:46:44	106.73	27.80	19.5 %	5.56
25 Miles	2:15:47	135.78	29.05	20.4 %	5.81
26 mi 385 yd or 26.22 miles rounded to hundredths	2:22:43	142.72 min	6.94 min	49%	6.94 min / 1.22 mi = 5.69 min/mi

Average min / mile for course	142.72 min. / 26.22 miles = 5.44 min/mile

INGRID KRISTIANSEN

Checkpoint	Time Hr : Min : Sec	Accumulated Time in mins. (hundredths)	Time from last checkpoint (hundredths)	% of total time from last checkpoint (tenths)	min / mile since last checkpoint (hundredths)
5 Miles	0:26:00	26.00	26.00	17.9 %	5.20
10 Miles	0:52:52	52.87	26.87	18.5 %	5.37
15 Miles	1:20:15	80.25	27.38	18.9 %	5.48
20 Miles	1:48:51	108.85	28.60	19.7 %	5.72
25 Miles	2:17:50	137.83	28.98	20.0 %	5.80
26 mi 385 yd or 26.22 miles rounded to hundredths	2:24:55	144.92	7.09	4.9 %	5.81

Average min / mile for course	144.92 min / 26.22 miles = 5.53 min/mile

ROB deCASTELLA

Checkpoint	Time Hr : Min : Sec	Accumulated Time in mins. (hundredths)	Time from last checkpoint (hundredths)	% of total time from last checkpoint (tenths)	min / mile since last checkpoint (hundredths)
5 Miles	0:24:11	24.18	24.18	18.9 %	4.84
10 Miles	0:48:42	48.70	24.52	19.2 %	4.90
15 Miles	1:12:43	72.72	24.02	18.8 %	4.80
20 Miles	1:37:08	97.13	24.41	19.1 %	4.88
25 Miles	2:01:08	121.13	24.00	18.8 %	4.80
26 mi 385 yd or 26.22 miles rounded to hundredths	2:07:51	127.85	6.72	5.3%	5.51

Average min / mile for course	127.85 min / 26.22 miles = 4.88 min/mile

In what portion of the race did the women have their best times? Where was Rob's best time? Are there differences? What would you ask Joan or Ingrid? What do you know about the course itself? Where is it downhill? Where is Heartbreak Hill located? What about all this talk of "hitting the wall" that runners can experience?

Headline: THE BOSTON MARATHON'S WINNING WOMEN

Because of the current interest in women's athletic achievements, you want to write a feature article on female winners of the Boston Marathon. You have set up interviews with Joan Benoit (holder of current course record, 2:22:43, set in 1983) and Ingrid Kristiansen (first place female in 1986). Being a good investigative reporter, you will do some "homework" before interviewing them. Using official checkpoint times, you can see how they paced themselves, so you can ask intelligent questions and get the most out of the interviews. One big and looming question is "Do the winning males and females run different style races?" The only male course records available were those from 1986 winner, Rob DeCastella. Using this information, what generalizations will you be able to make about winning females?

Before you begin your calculations, you need to know how to change 26 miles 385 yards to a decimal numeral representing miles.

1 mile = _____ feet or _____ yards.

385 yards is what part of a mile? _____ (fraction) = _____ (decimal, rounded to hundredths)

So now, 26 miles 385 yards = _____ miles.

You also need to know how to change time represented as hours:minutes:seconds to a decimal numeral representing minutes.

Let's look at 2:22:43 2 hours = _____ minutes.

43 seconds is what part of a minute? _____ (fraction) = _____ (decimal, rounded to hundredths)

So ..... 2 : 22 : 43 equals

____ . min

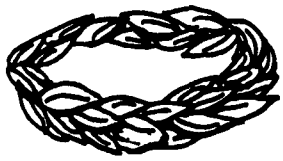
22 . min

\+ . ____ min

_____

. min

Or 2 : 22 : 43 = _____ min



JOAN BENOIT

Checkpoint	Time Hr : Min : Sec	Accumulated Time in mins. (hundredths)	Time from last checkpoint (hundredths)	% of total time from last checkpoint (tenths)	min / mile since last checkpoint (hundredths)
5 Miles	0:26:11			18.3%	
10 Miles	0:51:38	51.63 min.		%	
15 Miles	1:18:56		27.30	%	5.46
20 Miles	1:46:44			%	
25 Miles	2:15:47			%	
26 mi 385 yd or ___ miles rounded to hundreths	2:22:43	142.72 min	6.94 min	4.9%	$\frac{6.94 \text{ min}}{1.22 \text{ mi}} = 5.69 \frac{\text{min}}{\text{mi}}$

Average min / mile for course	$\frac{142.72 \text{ min.}}{\_\_\_ \text{ miles}} = 5.44 \frac{\text{min}}{\text{mile}}$

INGRID KRISTIANSEN

Checkpoint	Time Hr : Min : Sec	Accumulated Time in mins. (hundredths)	Time from last checkpoint (hundredths)	% of total time from last checkpoint (tenths)	min / mile since last checkpoint (hundredths)
5 Miles	0:26:00			%	
10 Miles	0:52:52			%	
15 Miles	1:20:15			%	
20 Miles	1:48:51			%	
25 Miles	2:17:50			%	
26 mi 385 yd or ___ miles rounded to hundreths	2:24:55			%	

Average min / mile for course	$\frac{\text{min.}}{\text{miles}} = \square \frac{\text{min}}{\text{mile}}$

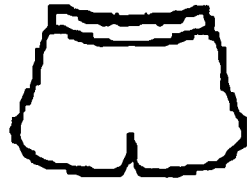
ROB deCASTELLA

Checkpoint	Time Hr : Min : Sec	Accumulated Time in mins. (hundredths)	Time from last checkpoint (hundredths)	% of total time from last checkpoint (tenths)	min / mile since last checkpoint (hundredths)
5 Miles	0:24:11			%	
10 Miles	0:48:42			%	
15 Miles	1:12:43			%	
20 Miles	1:37:08			%	
25 Miles	2:01:08			%	
26 mi 385 yd or ___ miles rounded to hundreths	2:07:51			%	

Average min / mile for course	$\frac{\text{min}}{\text{miles}} =$		$\frac{\text{min}}{\text{mile}}$

In what portion of the race did the women have their best times? Where was Rob's best time? Are there differences? What would you ask Joan or Ingrid? What do you know about the course itself? Where is it downhill? Where is Heartbreak Hill located? What about all this talk of "hitting the wall" that runners can experience?

EDITOR'S NOTES



TITLE: Vive la Difference !!

NATURE OF ACTIVITY: Graphing

OBJECTIVES: To develop comparison line graphs using statistics presented in charts
To read and interpret data from tables/charts
To analyze graphed data

PRE-SKILLS: Reading charts, plotting points on a graph, reading stopwatch notation

MATERIALS: AGE STATISTICS 1985 Chart, DIVISION RESULTS 1985 Chart. (See press notes)

NOTES: Teacher may wish to discuss the advantages of graphing different statistics on one set of axes for the sake of comparison. To make sure that students understand how to plot points correctly for times on the graph, a few may be done as a whole class activity. Charts may be displayed on bulletin board or overhead projector or distributed to groups or teams of students to minimize the number of pages to be reproduced. More capable students may be able to determine their own axes labels and use grid paper rather than using the attached graphing sheets.

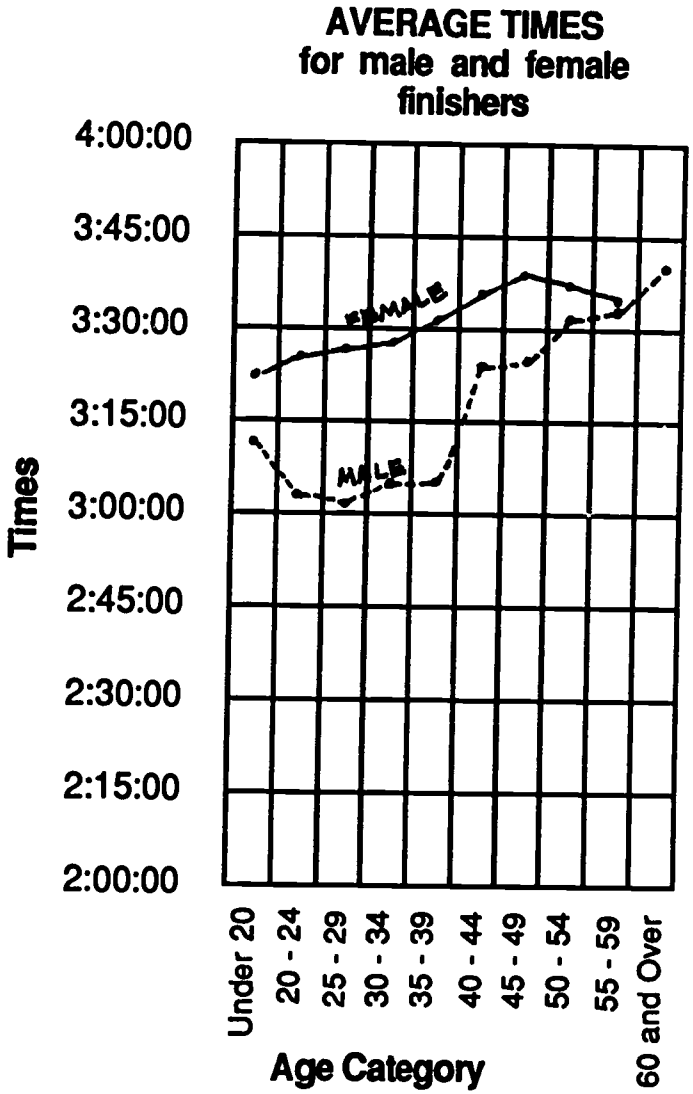
Charts use AVGE as an abbreviation for average. Students may need help in rounding these times to the nearest minute, 15 minutes etc., as well as in reading the hrs: min: sec notation.

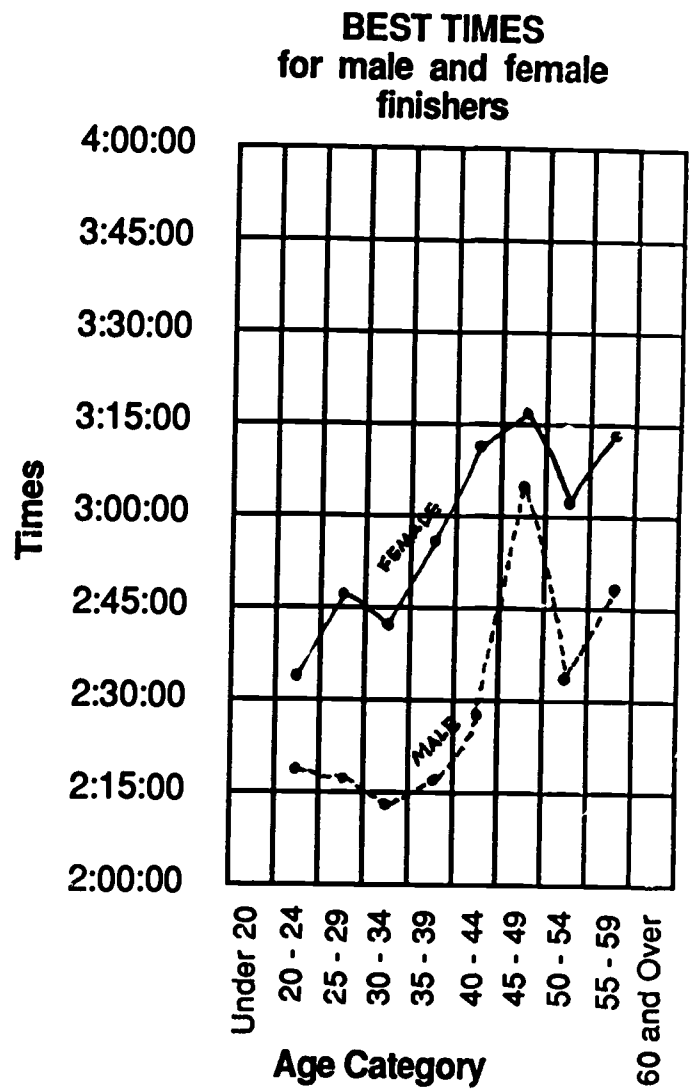
Part (3) is difficult! Note that the age categories are divided differently (but the times are in order). Students must think of the age category then locate the best (it will be the first listed) time in that category.

The blank Pct. Finished column will be used in another activity. (Am I There Yet?)

FURTHER DISCUSSION / FOLLOW-UP: Discussion of the questions is very important after students have completed their graphs.
See Are You Fit?, Am I There Yet?, Boston's Winning Women

Vive La Difference!!





Boston Marathon 1985

Regional Math Network • Harvard Graduate School of Education • Harvard University

Headline: VIVE LA DIFFERENCE!!

It's Boston Marathon time and your editor wants to run a feature article on the differences between male and female running performances. Your background research tells you that women have been allowed officially to run the Marathon only since 1972. You have decided to graph some statistics you obtained from the BAA (Boston Athletic Association) to aid in your analysis.

You've gathered the 1985 BAA statistics, and you decide that line graphs will give the clearest picture of the differences between average times and best times for each of several age catagories. (When you finish you will have two graphs.)

(1) Using the table "MALE DISTRIBUTION OF RUNNERS BY AGE," locate the average time for each age category. Plot those times approximating the minutes on the AVERAGE TIMES graph. Draw a dotted line connecting the times you just plotted. Label this broken line "males' averages."

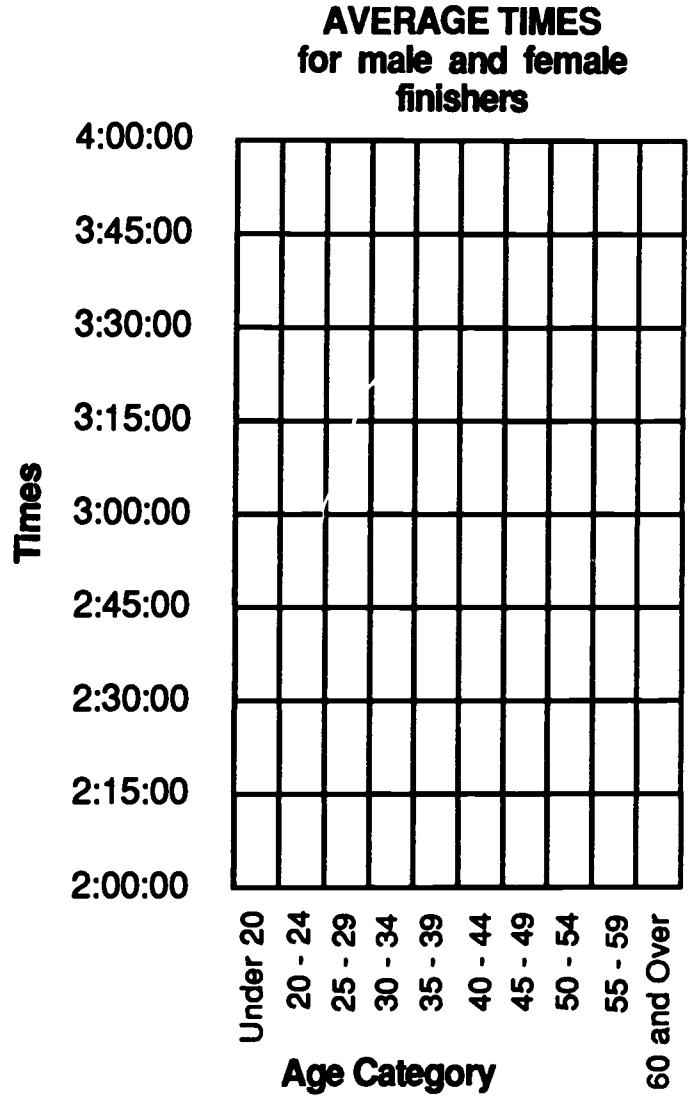
(2) Repeat the process above for "FEMALE DISTRIBUTION OF RUNNERS BY AGE". Use a solid line and label it "females' averages."

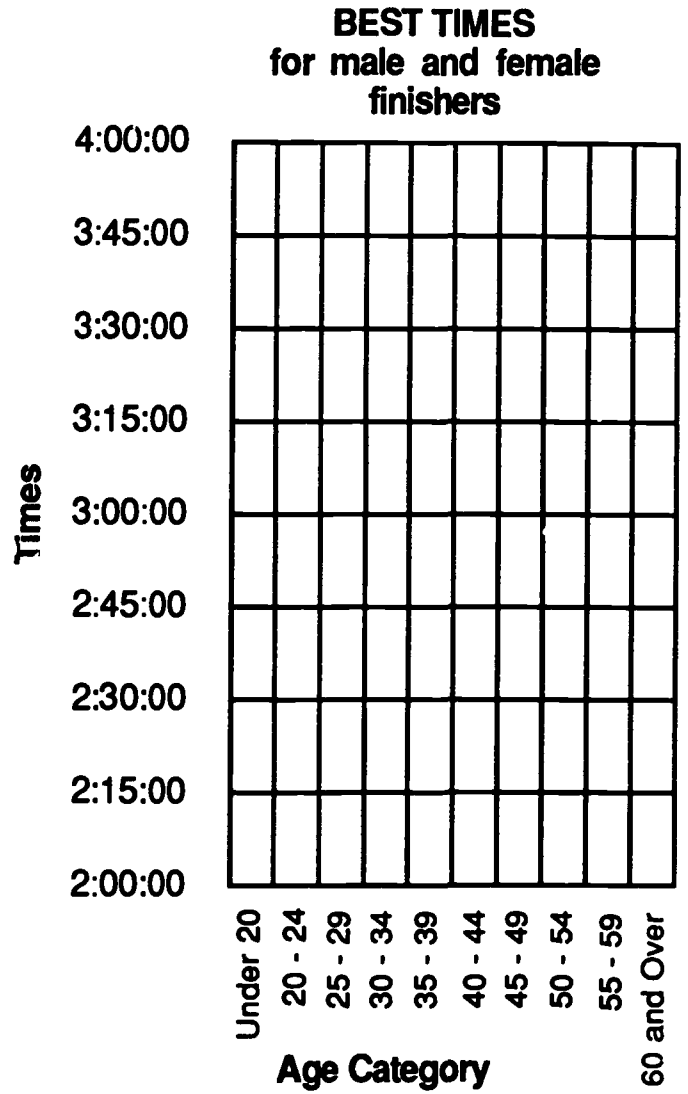
(3) Using the "DIVISION RESULTS" for males, search for the best times for each age category. Circle them in the chart when you find them, then plot them on the BEST TIMES graph. Draw a dotted line connecting these times and label it "males' best."

(4) Repeat the process above using "DIVISION RESULTS" for females. Use a solid line and label it "females' best".

Women haven't been running in the Marathon for very long? Do you think that fact could affect the average or best times? At what ages do you see peak performances? What could account for differences you've found?

Vive La Difference!!





Boston Marathon 1985

EDITOR'S NOTES

TITLE: Am I There Yet?

NATURE OF ACTIVITY: Graphing

OBJECTIVES: To read data from a chart
To plot points and draw a line graph
To convert ratios to percent form
To analyze a line graph

PRE-SKILLS: Converting ratios to decimals (calculator suggested), rounding to nearest 5%

MATERIALS: Age Statistics Chart for 1985

NOTES: Discuss charts. Why does the number of people entering not equal the number of people starting (are the ratios different for men and women)? Decide upon an appropriate scale for the vertical axis. The numbers must go from 0 to 1000. Having each block represent 50 may be best. Discuss why a graph should be used to display this data. Does it make analysis easier than using the table only? Are trends and patterns more apparent?

Graphs may be done on grid paper using a larger format. Review conversion from ratio (finishing:starting) form to percent form. A calculator should be used here. Students should round to nearest 1% or 5% at the discretion of the teacher.

FURTHER DISCUSSION / FOLLOW-UP:
See other activities for similar graphing experiences (Vive La Difference!!). Discuss how the pictures would differ if different scales were used. Discuss the comparison between the two graphs. Do high and low points occur in the same places? Why? Does "most finishers" imply the highest percent?

■AGE STATISTICS 1985

MALE DISTRIBUTION OF RUNNERS BY AGE

AGE	NO. ENTERED	NO. STARTED	NO. FINISHED	AVGE TIME	PCT. FINISHED	Rounded to nearest 5%
UNDER 20	18	15	13	03:13:39	87%	90%
20 - 24	267	240	185	03:05:10	77%	75%
25 - 29	704	634	490	03:02:35	77%	75%
30 - 34	780	714	562	03:05:59	79%	80%
35 - 39	647	593	479	03:07:53	81%	80%
40 - 44	1262	1144	903	03:24:00	79%	80%
45 - 49	596	555	443	03:26:15	80%	80%
50 - 54	409	365	281	03:30:13	77%	75%
55 - 59	141	122	78	03:33:14	64%	65%
60 & OVER	66	64	36	03:40:16	57%	60%
TOTALS	4894	4466	3472	03:15:59	78%	80%

THE AVERAGE RUNNER WAS 36.2 YEARS OLD

FEMALE DISTRIBUTION OF RUNNERS BY AGE

AGE	NO. ENTERED	NO. STARTED	NO. FINISHED	AVGE TIME	PCT. FINISHED	
UNDER 20	7	7	6	03:23:50	86%	85%
20 - 24	76	65	44	03:25:41	68%	70%
25 - 29	171	155	119	03:26:54	77%	75%
30 - 34	169	159	112	03:27:06	70%	70%
35 - 39	125	117	91	03:30:52	78%	80%
40 - 44	88	66	50	03:37:53	57%	55%
45 - 49	34	34	25	03:40:31	74%	75%
50 - 54	22	22	10	03:39:36	45%	45%
55 - 59	8	8	2	03:38:33	25%	25%
60 & OVER	1	1	0	00:00:00	0%	0%
TOTALS	701	656	459	03:29:51	70%	70%

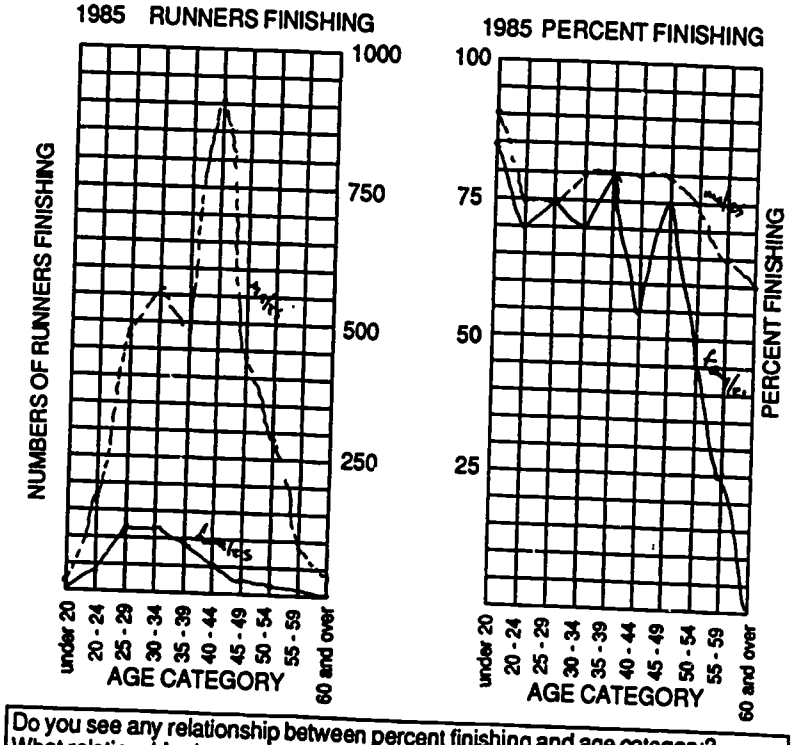
THE AVERAGE RUNNER WAS 32.0 YEARS OLD

Headline: AM I THERE YET?

Your editor loved a recent article "VIVE LA DIFFERENCE" which compares marathon times for men and women. The readers are clamoring for more. You must write a sequel to that article, but this time the angle should be a comparison of numbers of men and women who finish the race.

You refer to the table on age statistics to graph the information your editor has requested; but before you can graph the percents, you must complete the tables (the column labeled "percent finished").

You will make broken line graphs to analyze the data. Use a dotted line for the males and label it "males". Use a solid line for the females and label it "females".



Do you see any relationship between percent finishing and age category? What relationship do you see between age and numbers of runners?

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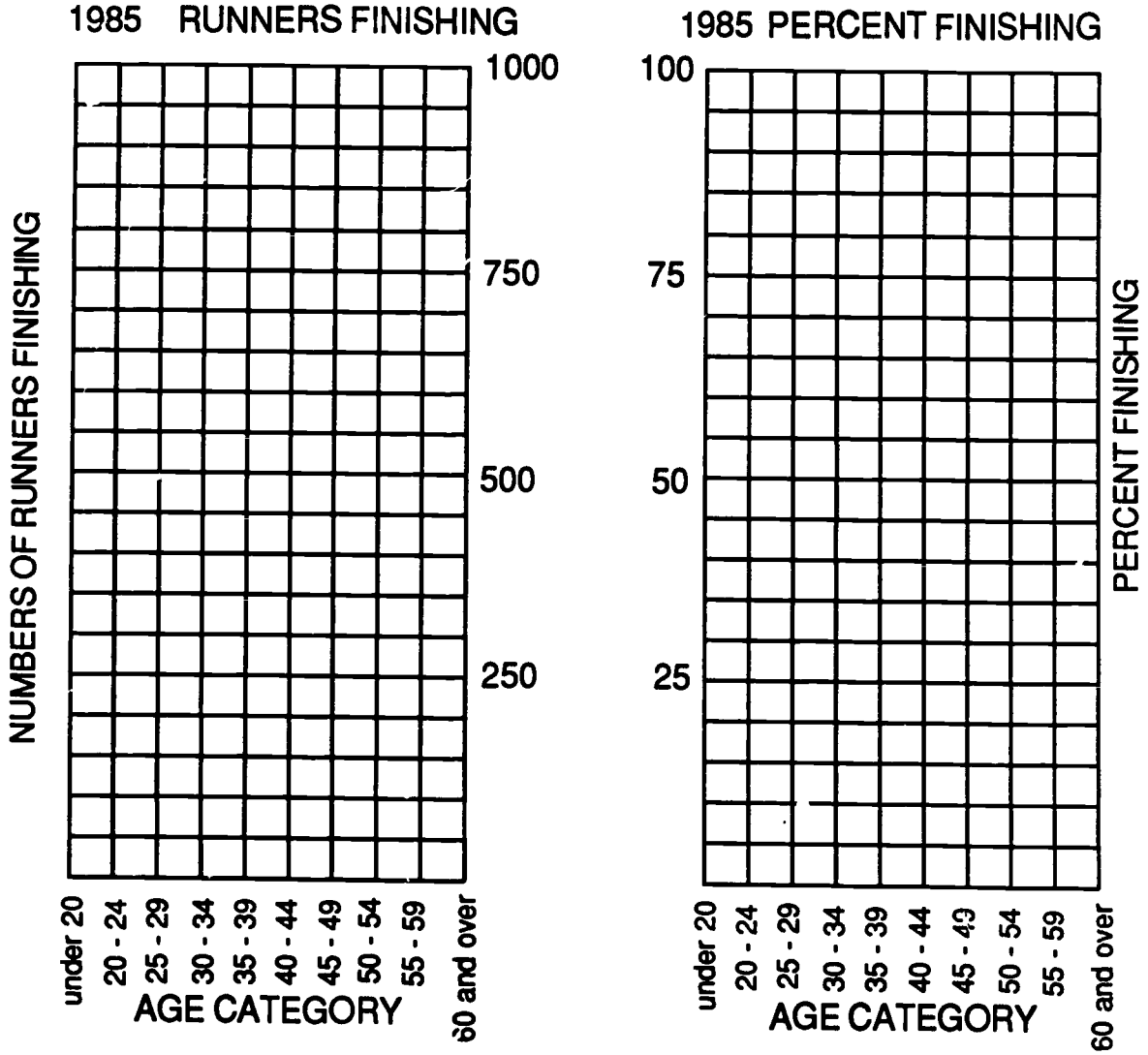

Do you see any relationship between percent finishing and age category? What relationship do you see between age and numbers of runners?

AGE STATISTICS 1985

MALE DISTRIBUTION OF RUNNERS BY AGE

AGE	NO. ENTERED	NO. STARTED	NO. FINISHED	AVGE TIME	PCT. FINISHED
UNDER 20	18	15	13	03:13:39	
20 - 24	267	240	185	03:05:18	
25 - 29	704	634	490	03:02:33	
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35 - 39	647	593	479	03:07:53	
40 - 44	1262	1144	903	03:24:00	
45 - 49	598	555	443	03:26:15	
50 - 54	409	385	281	03:30:13	
55 - 59	141	122	78	03:33:14	
60 & OVER	68	64	38	03:40:16	
TOTALS	4894	4466	3472	03:15:59	

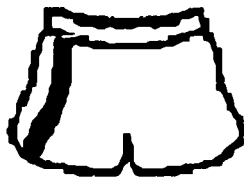
THE AVERAGE RUNNER WAS 38.2 YEARS OLD

FEMALE DISTRIBUTION OF RUNNERS BY AGE

AGE	NO. ENTERED	NO. STARTED	NO. FINISHED	AVGE TIME	PCT. FINISHED
UNDER 20	7	7	6	03:23:50	
20 - 24	76	65	44	03:25:41	
25 - 29	171	155	119	03:26:54	
30 - 34	169	159	112	03:27:08	
35 - 39	125	117	91	03:30:52	
40 - 44	88	88	50	03:37:53	
45 - 49	34	34	25	03:40:31	
50 - 54	22	22	10	03:39:36	
55 - 59	8	8	2	03:36:33	
60 & OVER	1	1	0	00:00:00	
TOTALS	701	656	459	03:29:51	

THE AVERAGE RUNNER WAS 32.8 YEARS OLD

EDITOR'S NOTES



TITLE: Ten Times the Fun! **NATURE OF ACTIVITY:** Worksheet

OBJECTIVE: To practice metric conversions
To practice estimation skills

PRE-SKILLS: Multiplying and dividing by powers of ten, adding whole numbers, converting fractions with denominators of ten to percents

MATERIALS: Meter stick, metric measuring tape, ruler, etc. (optional)

NOTES: Metric conversions should be made mentally by multiplying or dividing by powers of ten. Explain to students that this is done by movement of the decimal point to the right or left. Students may need to review the relationship between meter and centimeter as well as to have a visual image of the relative lengths. Discuss what a point total greater than 1000 means (better than world record). Mention prefixes such as deca-, penta-, tri-, etc. What other sports events involve such prefixes (pentathalon, triathalon, etc)? Compute the time (in seconds) if Jenner had run the 400-meter or the 1500-meter at the same rate as the 100-meter. Why are these times different from his actual performance? Having students predict their own best times or distances is a good estimation exercise. They may need to think about their own best event (imagining what it is) based on individual talents or strengths as compared to Jenner's performance or the world record (half as good, one-fourth as good, etc).

FURTHER DISCUSSION / FOLLOW-UP: Find the school records (times or distances) for some of these events. What numbers of points would they deserve? If a stopwatch is available, have students run a 100-meter dash outside. Use this to assign "reasonable" point values for the class or individuals. Point assignments should be estimates as the relationship between points and performance is not a linear one. See Are You Fit? activity, Olympic Decathalon for the Apple by Microsoft, Inc.

Headline: TEN TIMES THE FUN

You've been asked to write a human interest article to highlight Olympian Bruce Jenner's upcoming appearance in the area. The newspaper's archives give you the following data:

Olympic Decathalon Performance 1976 Bruce Jenner

Event	Points	Performance
100 - Meter Dash	819	10.94 sec.
Long Jump	865	7.22 m = 722 cm
Shot Put	810	15.36 m = 1536 cm
High Jump	882	2.03 m = 203 cm
400 - Meter Dash	922	47.51 sec.
110 - Meter Hurdles	866	14.84 sec.
Discus Throw	873	50.04 m = 5004 cm
Pole Vault	1005	4.8 m = 480 cm
Javelin Throw	862	68.53 m = 6853 cm
1500 - Meter Run	714	4 min. 12.61 sec = 252.61 sec.
TOTAL POINTS	8618	

Points in a decathalon are awarded for performance relative to the world record in the event. Record performance = 1000 points.

A decathalon has 10 events. Bruce Jenner's winning performance earned 8618 total points. His best event was the POLE VAULT, his worst was the 1500 METER RUN. His average point total was 861.8.

How many of the ten events...

involve running? 4 or 8 ANSWERS WILL VARY — Percent of total events 40% or 80%

involve jumping? 4 — Percent of total events 40%

involve tossing or throwing? 3 — Percent of total events 30%

Does the percent total equal 100? NO Why? HURDLES COUNTS TWICE

You know Bruce Jenner's score, and you know that the world record earns 1000 points. How would you score in each event?

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You've been asked to write a human interest article to highlight Olympian Bruce Jenner's upcoming appearance in the area. The newspaper's archives give you the following data:

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Javelin Throw	862	68.53 m = ___ ___ cm
1500 - Meter Run	714	4 min. 12.61 sec = _____ sec.
TOTAL POINTS		

Points in a decathalon are awarded for performance relative to the world record in the event. Record performance = 1000 points.

A decathalon has _____ events. Bruce Jenner's winning performance earned _____ total points. His best event was the _____, his worst was the _____. His average point total was _____.

How many of the ten events...
involve running? _____ Percent of total events _____
involve jumping? _____ Percent of total events _____
involve tossing or throwing? _____ Percent of total events _____
Does the percent total equal 100? _____ Why? _____

You know Bruce Jenner's score, and you know that the world record earns 1000 points. How would you score in each event?

Miscellaneous Sports
Editor's Choice

EDITOR'S NOTES

TITLE: Let's Go Bowling!

NATURE OF ACTIVITY: Worksheet

OBJECTIVES: To practice mental computation
To find fractional, decimal, and percent equivalents
To reinforce the concept of percent

PRE-SKILLS: Solving proportions mentally and finding equivalent fractions with denominators of 10, 40, or 100, familiarity with averaging

MATERIALS: None

NOTES: The teacher may wish to hold some discussion of bowling terms and symbols and review scoring for candlepin bowling. (There are differences between candlepin and tenpin!) Examples are given for changing fractions to percent forms but review may be necessary. Have students fill in the score sheet including names for the players. To compute the average number of pins knocked down per frame, students need to understand that the score represents the total pins knocked down. Stress mental division by ten. In the tally charts students should be reminded that strikes and spares will be tallied, but the number of additional pins in the frame will not appear. Foursome tally should total 40. In some proportions using an equivalent fraction with a denominator larger than one hundred is preferable to using the reduced form.

Ex. $1/40 = 5/200$ $5/200=n/100$ $n=2.5$

Stress that the tally sheets show the percent of time the bowlers achieve the various categories of pin fall.

FURTHER DISCUSSION / FOLLOW-UP: The tally sheet could be used with new data generated by a class trip or a bowling game (commercial or homemade). Students could also watch T.V. bowling (Saturday) and keep score for professional bowlers. Extend the tally sheet to get the total pins. Compare this number with the sum of the scores and discuss why they are different (sum of scores includes the "open frame" pins). Focus on the concept of average by working backwards. Give students a typical average and work backwards to fill in a possible score sheet. Compare results to see the variety of frames that generate the same total score. With ten frames there are several approaches.

(a) "Play" with the numbers to make the sum come out appropriately.
(b) Work with the average and generate pairs of scores (one higher and one lower).
(c) Use the "average" as the pin fall for each frame.

Discuss when all three of these approaches can be used. (i.e. What happens when the average is not a whole number.)

This is a good opportunity to discuss statistical terms like mean, median and mode, to describe the various categories of pin fall in the group tally.

Headline : Let's Go Bowling!

At last! Your editor gave you the day off. You went candlepin bowling with a few friends and had such a good time that you suggested a bowling feature article for the next vacation supplement. Your editor (a non-bowler) wanted some more information so you've included the following definitions and as much of the score sheet as you can reconstruct from your torn copy.

Definitions and Symbols

Frame: one turn consisting of throwing three balls. There are ten frames per string (game).

Strike: knocking down all ten pins with the first ball. The total number of pins knocked down by the next two balls is included in the strike frame and also counted toward the total for the next frame.

Spare: knocking down all ten pins with two balls. The number of pins knocked down by the next ball is included in the spare frame and also counted as the first ball in the next frame.

X shorthand way to write that all ten pins were knocked down with three balls.

Complete the chart

	You	StringTotal	Friend 1	StringTotal	Friend 2	StringTotal	Friend 3	StringTotal
1	—	7	—	6	—	9	—	6
2	8	15	9	15	X	19	4	20
3	5	20	9	24	8	27	8	28
4	X	30	9	43	X	37	8	36
5	7	37	X	53	6	43	7	43
6	2	49	7	60	9	52	5	48
7	7	56	9	79	X	62	8	56
8	X	66	4	93	6	78	7	63
9	5	81	7	100	8	86	7	70
10	9	90	8	108	7	93	8	78
	Average pins per frame	9		10.8		9.3		7.8

Let's Go Bowling !

Analysis of the scoresheet will provide interesting data for the article.

Each player bowls 10 frames. The total frames by all four players is 40.

Your individual ten frame tally looks like this :

# of pins	1	2	3	4	5	6	7	8	9	X	spare	strike	
tally					I		III	I	I	II	II		
frequency	0	0	0	0	1	0	3	1	1	2	2	0	10

Complete the percents for each kind of pin fall

fraction	0/10	0/10	0/10	0/10	1/10	3/10	3/10	1/10	1/10	2/10	2/10	0/10	
percent	0%	0%	0%	0%	10%	0%	30%	10%	10%	20%	20%	0%	100%

Tally for your foursome

# of pins	1	2	3	4	5	6	7	8	9	X	spare	strike
tally					II	III	IIII	IIII	III	II	IIII	I
frequency					2	3	9	8	5	6	6	1
fraction of total frames					2/40 = 1/20	3/40	9/40	1/5	1/8	3/20	6/40 = 3/20	1/40 = 5/200
percent of total frames					1/20 = n/100 5%	7.5%	22.5%	20%	12.5%	15%	3/20 = n/100 15%	5/200 = n/100 2.5%

Note: 6 counts in the spare tally but not in the 6 tally.

What would the scoresheet for a "perfect game" look like? Is it possible to have a scoresheet with no numerals (only symbols in the left column)? Can the average for ten frames be greater than ten pins down? Explain your answer.

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At last! Your editor gave you the day off. You went candlepin bowling with a few friends and had such a good time that you suggested a bowling feature article for the next vacation supplement. Your editor (a non-bowler) wanted some more information so you've included the following definitions and as much of the score sheet as you can reconstruct from your torn copy.

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X shorthand way to write that all ten pins were knocked down with three balls.

Complete the chart

	You		Friend 1		Friend 2		Friend 3	
		StringTotal		StringTotal		StringTotal		StringTotal
1	—	7	—	6	—	9	—	6
2	8	15		15	X		4	
3		20	9		8	27	8	28
4	X		9		X			36
5	7	37	X	53	6	43	7	
6	2			60		52	5	
7	7	56	9		X	62	8	56
8	X		4	93	6			63
9		81		100	8	86	7	70
10	9		8	108	7			78
	Average pins per frame							

Let's Go Bowling !

Analysis of the scoresheet will provide interesting data for the article.

Each player bowls _____ frames. The total frames by all four players is _____.

Your individual ten frame tally looks like this :

# of pins	1	2	3	4	5	6	7	8	9	X	spare	strike	
tally					I		III	I	I	II	II		
frequency	0	0	0	0	1	0	3	1	1	2	2	0	10

Complete the percents for each kind of pin fall

fraction	0/10				1/10					2/10			
percent	0%				10%					20%			100%

Tally for your foursome

# of pins	1	2	3	4	5	6	7	8	9	X	spare	strike
tally												1
frequency					2			8				1
fraction of total frames					$\frac{2}{40} = \frac{1}{20}$							$\frac{1}{40} = \frac{5}{200}$
percent of total frames					$\frac{1}{20} = \frac{n}{100}$ 5%							$\frac{5}{200} = \frac{n}{100}$ 2.5%

Note: 6 counts in the spare tally but not in the 6 tally.

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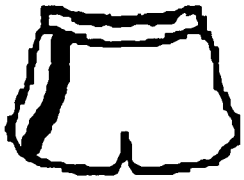


EDITOR'S NOTES

TITLE: Are You Fit?

NATURE OF ACTIVITY: Graphing

OBJECTIVES: To read and interpret data from a chart or table
To plot points and sketch line graphs
To make predictions based on a chart or table
To analyze line graphs and form conclusions

PRE-SKILLS: Some experience in constructing line graphs, ability to locate decimals on a number line

MATERIALS: Graph/grid paper (optional)

NOTES: Discuss the data in the chart. Note that numbers are to the nearest tenth unless a hundredths digit is a five. Discuss different ways to make predictions. Encourage students to be original but with an underlying assumption or hypothesis. Discuss appropriate scales for the vertical axis (What are thelongest and shortest times?) Students may find it easier to lightly sketch grids before locating points. Graph paper could be used as an alternative to page 2.

Discuss whether charting or graphing is the better basis for comparisons or conclusions and why.

Have students suggest appropriate titles for an article about the results.

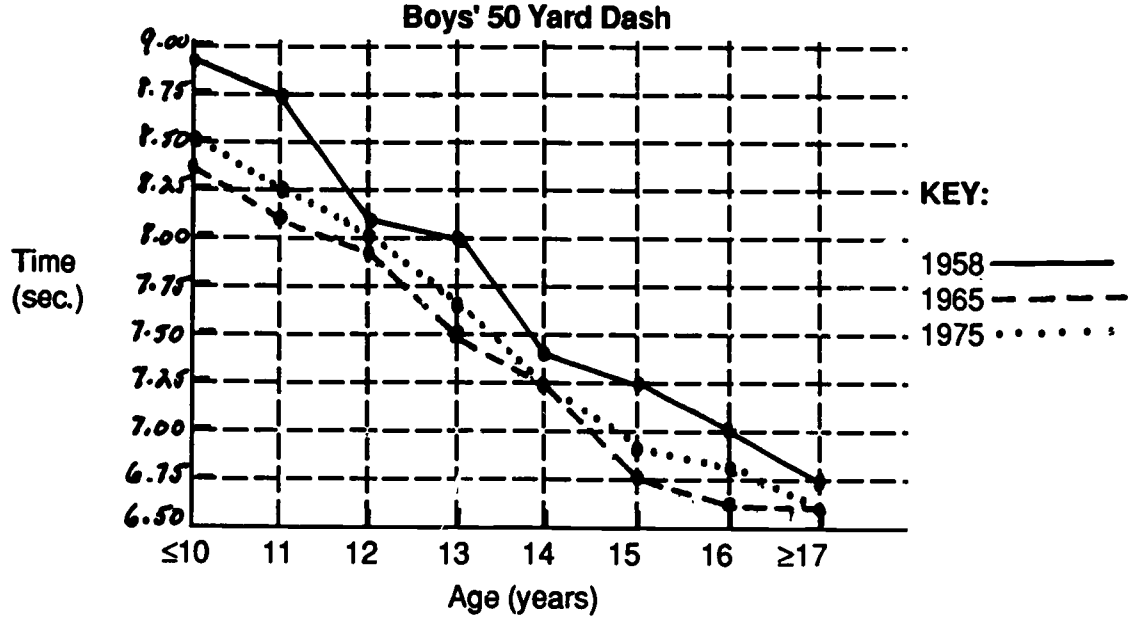
FURTHER DISCUSSION / FOLLOW-UP: Have students graph their '85 predictions and discuss what might be the reasons for differences between this and other years. Plan an outdoor activity to generate boy and girl class averages for the 50-yard dash. Stop watch times could be taken, averages computed, and the points plotted.

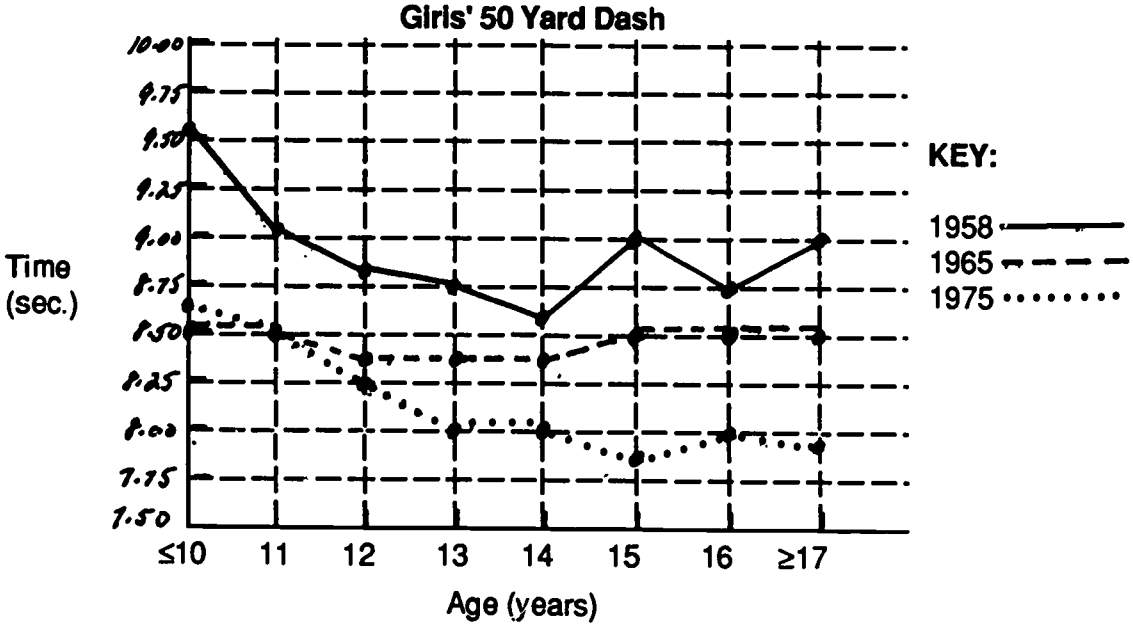
Contact AAHPERD at 1900 Association Drive, Reston, Virginia 22091 for more up-to-date data.

Contact the President's Council on Physical Fitness and Sports at 450 5th St. NW, Suite 7103, Washington DC, 20001 for more information about the Fitness Award Program.

Since you don't want to fill up the page with only numbers, you decide to present the 1958, 1965, and 1975 information in graph form. You will make separate graphs for boys and for girls, but only one graph (with all three years) for each.

Decide on an appropriate scale for the times (think of the fastest and slowest times). Select different colors, dotted or solid lines, etc. to indicate the different years (display your key below).





Using the graphs as the basis of your article, what will your conclusions be? What would be an appropriate title or headline?

Headline: Are You Fit?

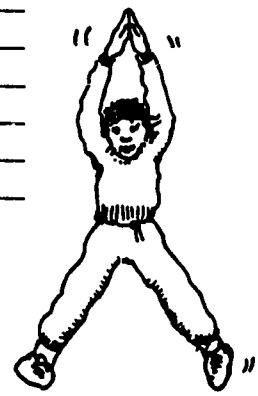
For a special 'Student Section' in this Sunday's paper you have been asked to do an article on the results of the A.A.H.P.E.R.D. Youth Fitness Awards.

In your search for background information you find that A.A.H.P.E.R.D. stands for American Alliance for Health, Physical Education, Recreation, and Dance. You recognize their awards as the Presidential Physical Fitness Awards. The age categories are "under 10" to "17 and over".

Your article concerns the 50 yard dash. The information isn't as current as you would like, so you use your "Reporter's License" and predict what the '85 times would be. Taking the information that you do have from other years, you can be fairly accurate. You will decide on a headline after looking more closely at the data.

Make your predictions of the 1985 results.

		Average Time in Seconds			
	Age	**1958**	**1965**	**1975**	**1985**
BOYS	≤10	8.9	8.4	8.5	____
	11	8.75	8.1	8.25	____
	12	8.1	7.9	8.0	____
	13	8.0	7.5	7.6	____
	14	7.4	7.25	7.25	____
	15	7.25	6.75	6.85	____
	16	7.0	6.6	6.8	____
	≥17	6.75	6.6	6.6	____
GIRLS	≤10	9.55	8.5	8.6	____
	11	9.0	8.5	8.5	____
	12	8.8	8.4	8.25	____
	13	8.75	8.4	8.0	____
	14	8.6	8.4	8.0	____
	15	9.0	8.5	7.9	____
	16	8.75	8.5	8.0	____
	≥17	9.0	8.5	7.95	____

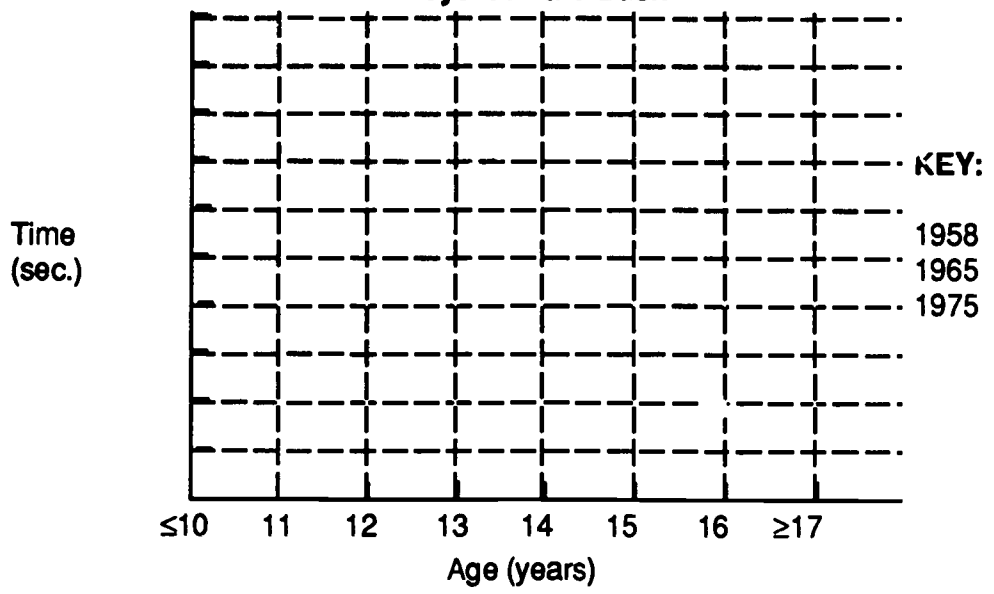


How did you make these predictions? Are the times better or worse than in previous years? Are the kids in better shape? Why?

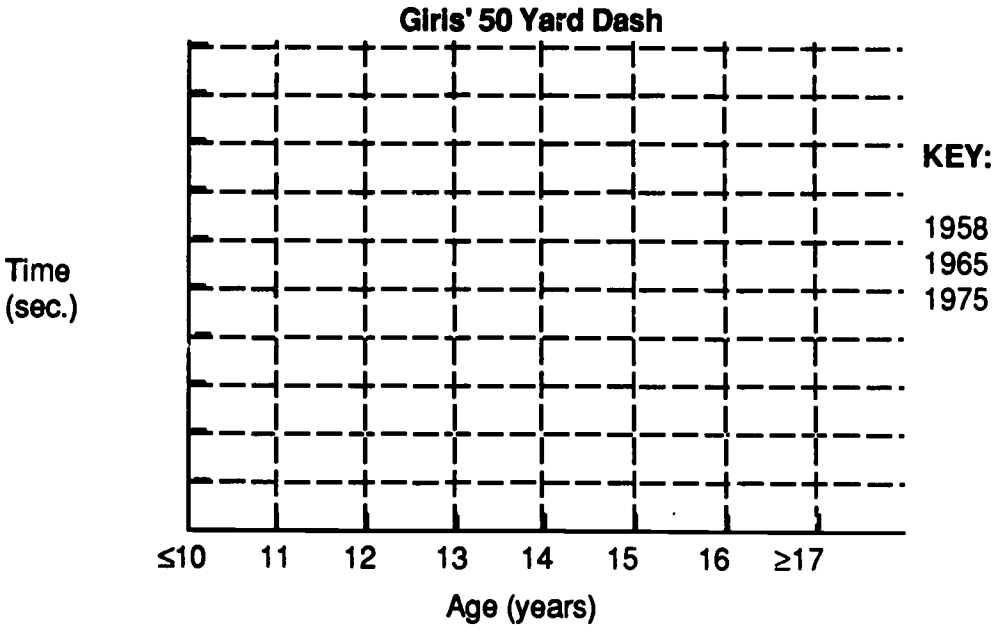
Since you don't want to fill up the page with only numbers, you decide to present the 1958, 1965, and 1975 information in graph form. You will make separate graphs for boys and for girls, but only one graph (with all three years) for each.

Decide on an appropriate scale for the times (think of the fastest and slowest times). Select different colors, dotted or solid lines, etc. to indicate the different years (display your key below).

Boys' 50 Yard Dash

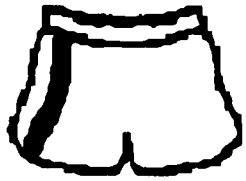


Girls' 50 Yard Dash



Using the graphs as the basis of your article, what will your conclusions be? What would be an appropriate title or headline?

EDITOR'S NOTES



TITLE: It's Foreign to Me

NATURE OF ACTIVITY: Writing Project

OBJECTIVES: To write an accurate and concise description of a well-known or imaginary sport
To create decimal and/or percent expressions to replace any numbers involved in the description

PRE-SKILLS: Some experience with decimals and percents, knowledge of rules for order of operations

MATERIALS: encyclopedia, sports magazines (optional)

NOTES: In writing their descriptions, students are not to mention the name of the sport being described. They should be encouraged to include lots of numbers (size of field/arena, size of equipment, number of players, etc.) It is easiest to start with a complete written description and then go back to replace numbers with the corresponding expression. Students who can guess the sport quickly should be encouraged to write rather than say their guesses. Students may need to review rules for order of operations and use of parentheses, brackets, etc. Sketching the ball and field to appropriate scale are good visual estimation exercises.

FURTHER DISCUSSION / FOLLOW-UP: Less able writers could start with a shorter description (paragraph) or a copy of an existing description or definition from a sports book, manual, magazine, etc., to annotate with computational exercises. Descriptions and sketches could be posted on a bulletin board or exchanged between students as a contest/game activity. Students might make up and describe an imaginary game or activity for other students to decode and act out. Profiles (short biographies) of professional athletes could also be used. Encourage students to focus on shirt number, personal statistics, age, etc. See At the Half game in Press Kit (teacher resource packet).

Headline: IT'S FOREIGN TO ME

The official Communist Party Newspaper People's Daily (Fall 1985) printed the following description of this American sport which originated in 1867.

"The players can pass the ball by using their feet or their hands. The ball, which is shaped like a rugby ball, is 28 centimeters long and 18 centimeters wide at the middle.

The playing field is 120 yards long and 53 yards wide, and the gate at both ends of the field is 10 yards wide.

One side can score six points by reaching the gate area of the other side and score another point if the ball is kicked into the gate from outside the gate zone.

Each side has 11 players, and a side loses its chance to attack if its players cannot move ahead 10 yards during four attacks."

Chicago-based T.L.I. International Corp. announced in January that it had negotiated arrangements with Chinese officials to air the game in two provinces. But *People's Daily* said Central Television now plans to broadcast the game nationwide.

'Young people, especially, like to watch it,' said a Peking taxi driver, making a fist and swinging it at an imaginary opponent. 'They like the excitement.'"

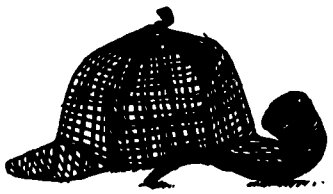
Clues that may help???

Sketch the ball.

Sketch the field.

Tell how many players.

Name the sport.



Your editor would like a similarly concise description of another well known sport as an activity for the puzzle page. You must replace each number with a decimal or percent expression to be evaluated, and you may not mention the name of the sport.

Example (see clipping):

"The playing field is 60 ÷ .5 yds. long and 20% of 265 yds. wide."

"Each side has 1 + 10% of 100 players,..."

Can all sports or games be described by mentioning a field or arena, equipment, scoring, player(s)? Do all the descriptions fit a pattern? What is it?

EDITOR'S NOTES

TITLE: Record Speeds

NATURE OF ACTIVITY: Oral reading exercise, worksheet

OBJECTIVES: To read and write the short word names for decimals

PRE-SKILLS: Reading and writing whole numbers, addition and subtraction with decimals

MATERIALS: Sports magazines, newspapers, etc. (optional)

NOTES: Have students read through sample and then read paragraph aloud. Students can work in twos or threes as practice announcers or commentators. Teacher may want to discuss abbreviations or have a student explain the terms.

	m.p.h.	- mile per hour
	c.c.	- cubic centimeter
*	b.h.p.	- brake horsepower

Discuss the difference between reading numbers such as $271,697.72 (... and 72 cents) and 5.54 seconds (... 54 hundredths). Are there other differences in how we read?

FURTHER DISCUSSION/ FOLLOW-UP: Discuss other areas in which students may read decimal numbers. Have students bring in various materials with decimal numbers included to share with the class. Newspapers, sports magazines, etc. are good sources. Have students work in pairs to read clippings with decimal numbers. Following up the reading with a writing exercise will reinforce the skill. Students can be asked to write word forms of the underlined numerals. Discussion about shape of track and length of lap (500 mi ÷ 200 mi.) generates good thinking practice. Students might be assigned to check current records. Have students write their own paragraphs using data from magazines or newspapers. See: It's Foreign To Me.

* *Brake horsepower* is less than the indicated horsepower by the amount lost due to friction within the engine (may amount to 10% or more of the indicated horsepower).

Decimal	Short Word Name
183.293 mph.	183 and 293 thousandths mph.
5.54 sec.	5 and 54 hundredths
162.962 mph.	162 and 962 thousandths
47.02 sec.	47 and 2 hundredths
191.408 mph.	191 and 408 thousandths
2.6 liters	2 and 6 tenths
45.21 sec.	45 and 21 hundredths
199.071 mph.	199 and 71 thousandths

Additional "color" material for the video:

The practice lap record is how many seconds faster than the race lap record?
1.81 sec.

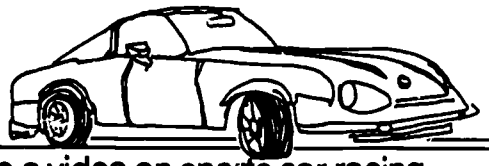
Mark Donohue's average speed was about how many times the 55 mph speed limit?
3 (nearest whole number)

The race record in minutes is 184 (round to nearest minute).

Each lap of the Indy 500 is how long? 2½ miles

Can you find some articles about other sports that use lots of decimal numbers? (You will need extra practice, after all.) What sports are most likely to be described using decimals? Where could you look to find such articles?

Headline: **RECORD SPEEDS**



You've been asked to narrate a video on sports car racing. Your reading must be flawless so you need to practice reading some decimal numbers like those shown below.

Sample:

The fastest recorded car race in the world is the NASCAR Grand National 125 mile event at Daytona International Speedway, Daytona Beach Florida. The record time is 40 minutes 55 seconds, with an average speed of 183.293 m.p.h. by William Caleb "Cale" Yarborough of Timmonsville, South Carolina, driving a 1969 Mercury V8 on February 19, 1970.

(Cale averaged 183 and 293 thousandths m.p.h. Note that the decimal point is read as "and" and the place of the last digit is read last.)

Read the introduction below aloud. After reading, re-write all decimals in their short word-name.

Indianapolis 500

The Indianapolis 500-mile race (200 laps) was inaugurated on May 30, 1911. The most successful drivers have been Warren Wilbur Shaw, who won in 1937, 1939, and 1940; Louis Meyer, who won in 1928, 1933, and 1936, and Anthony Joseph, "A.J." Foyt, Jr. who won in 1961, 1964, and 1967. Mauri Rose won in 1947 and 1948 and was the co-driver with Floyd Davis in 1941.

The record time is 3 hours 4 minutes 5.54 seconds (average speed 162.962 m.p.h.) by Mark Donohue driving a 2,595-c.c 900 b.h.p. turbocharged Sunoco McLaren M16B-Offenhauser on May 27, 1972. The record prize was $271,697.72 won by Al Unser on May 30, 1970.

The race lap record is 47.02 seconds (average speed 191.408 m.p.h.) by Wally Dallenbach of New Brunswick, New Jersey, driving a 2.6-liter turbocharged Eagle-Offenhauser on lap 2 of the race held May 26, 1974. The practice lap record is 45.21 average speed 199.071 m.p.h.) by Johnny Rutherford of Fort Worth Texas, driving a 2,595-c.c. 900-b.h.p. turbocharged Gulf-McLaren M16B-Offenhauser on lap 3 of his 4-lap qualificaton run on May 12, 1973.

The slowest winning time was recorded by the winner of the 1915 race, Ralph DePalma, who had to push his Mercedes the final 1-1/2 miles.

Decimal	Short Word Name
183.293 mph.	183 and 293 thousandths mph.
5.54 sec.	
162.962 mph.	
47.02 sec.	
191.408 mph.	
2.6 liters	
45.21 sec.	
199.071 mph.	

Additional "color" material for the video:

The practice lap record is how many seconds faster than the race lap record?
_____sec.

Mark Donohue's average speed was about how many times the 55 mph speed limit?
_____(nearest whole number)

The race record in minutes is _ _____ (round to nearest minute).

Each lap of the Indy 500 is how long? _____miles

Can you find some articles about other sports that use lots of decimal numbers? (You will need extra practice, after all.) What sports are most likely to be described using decimals? Where could you look to find such articles?

EDITOR'S NOTES

TITLE: Can You Imagine? **NATURE OF ACTIVITY**: Problem solving

OBJECTIVES: To practice problem solving strategies (especially counting techniques)
To review geometry terms (pentagon, hexagon, vertex, edge, etc.)
To practice visual imagery skills

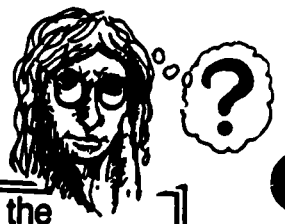
PRE-SKILLS: Some experience with geometry terminology

MATERIALS: Dictionary, crayons or markers (optional), glue or tape (optional)

NOTES: This is intended to be a fun activity with few prior skills needed. Students who think they know what the pattern is should be cautioned to write it rather than speak out and spoil the "surprise" for others. Stress that the ratios of hexagons and pentagons to total figures yield percentages of figures only, not surface areas. Discuss whether ratios of areas of pentagons and hexagons to total area would be greater or less, and why.

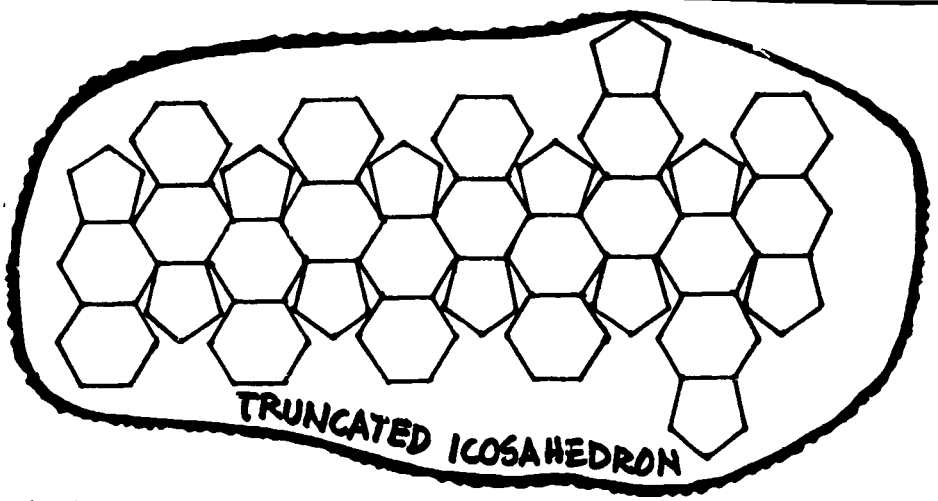
Counting the number of edges and vertices is not easy. Encourage strategies such as working with a smaller piece and extending the pattern. Discuss why the shape is called an icosahedron. Does it have twenty faces? What has really been truncated?

FURTHER DISCUSSION / FOLLOW-UP: Have students cut out, color and put together the model in the Press Kit (Teacher Package). The tabs may be helpful whether the model is taped or glued. Have capable students find the approximate surface area of the soccer ball by taking the original pattern and finding the area of the pentagon and hexagon. The shape can be divided into triangles with base and height measured (use mm). Familiarity with the formula $A = 1/2 \times b \times h$ is required. This answer could be compared with the surface area of the inscribed or circumscribed sphere (estimate a radius and use $A = 4\pi r^2$) to discuss what differences exist and why. See How Does the Baseball Really Measure Up?



Headline: Can You Imagine?

Because of your knowledge of sports, you've been assigned to aid in the investigation of a mystery. The scrap of paper below was found near the site of a now abandoned sports equipment factory. Gather all the information you can to help determine its use.



You had better look up **"truncated"** and **"icosahedron."**

The pattern seems to be made up of 5-sided figures called Pentagons and 6 -sided figures called hexagons.

Additional Observations (reduce all ratios):
Number of hexagons 20 of pentagons 12
Total number of figures 32
Ratio of hexagons to total figures 20:32 = 5:8
Ratio of pentagons to total figures 12:32 = 3:8

Shade or color the hexagons one way, the pentagons another.
Imagine cutting out the figure and taping edges together to form a solid.

What if the solid were formed, then
each pentagon would be surrounded by 5 hexagons.
each hexagon would be surrounded by 6 pentagons 3 hexagons
the number of edges (common sides) would be 90.
the number of vertices would be 60.
a typical vertex would be formed by what figures 2 hexagons and 1 pentagon

Now that you have collected the data, do you think this paper has any practical value? If this is a truncated icosahedron, what must a non-truncated icosahedron look like?

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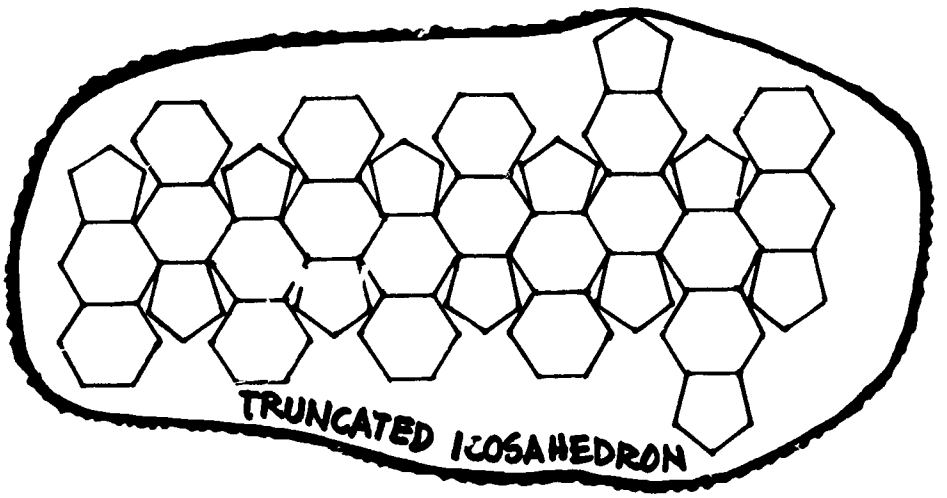
Headline: Can You Imagine?

Because of your knowledge of sports, you've been assigned to aid in the investigation of a mystery. The scrap of paper below was found near the site of a now abandoned sports equipment factory. Gather all the information you can to help determine its use.



You had better look up **"truncated"** and **"icosahedron."**

The pattern seems to be made up of 5-sided figures called _____ and _____ -sided figures called _____.

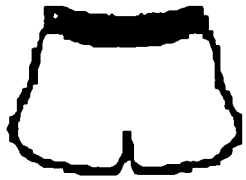
Additional Observations (reduce all ratios):
Number of hexagons _____ of pentagons _____
Total number of figures _____
Ratio of hexagons to total figures _____
Ratio of pentagons to total figures _____

Shade or color the hexagons one way, the pentagons another.
Imagine cutting out the figure and taping edges together to form a solid.

What if the solid were formed, then
each pentagon would be surrounded by _____.
each hexagon would be surrounded by _____.
the number of edges (common sides) would be _____.
the number of vertices would be _____.
a typical vertex would be formed by what figures _____.

Now that you have collected the data, do you think this paper has any practical value? If this is a truncated icosahedron, what must a non-truncated icosahedron look like?

EDITOR'S NOTES



TITLE: How Sweet It Is!! Is It Worth It? **NATURE OF ACTIVITY:** Worksheet

OBJECTIVES: To practice mental computation
To appreciate rate relationships and build equivalent fractions

PRE-SKILLS: Multiplication and division with whole numbers and decimals (to tenths), division of fractions

MATERIALS: Calorie count chart (optional)

NOTES: Mental computation must be stressed. Various approaches should be encouraged (eg. 10 can be thought of as 10 x 1 or 5 x 2; 50 as 5 x 10, 25 x 2, 50 x 1, etc.). Part of the chart requires problem solving thinking to find out the number of cookies before the number of minutes. An understanding of dimension analysis should be stressed. Students should be able to follow "cal ÷ cal / min = cal x min / cal = cal / cal x min = min" (but perhaps not duplicate it).

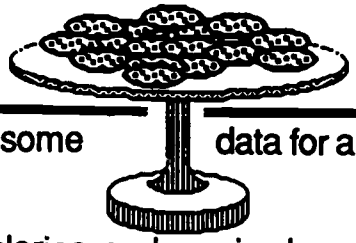
FURTHER DISCUSSION / FOLLOW-UP: A similar exercise can be done using a different food item. Calories can be converted to minutes of running time as above and a similar chart formed. Another variation would be to utilize alternative calorie burning activities (walking, swimming, etc.) as well as different foods. Students should be encouraged to organize data in chart form and use mental computations. See Is It Worth It?

Calories (Samples)	
ice cream (cone)	200 cal.
Doritos (8 g.)	150 cal.
hamburger	350 cal.
Coke (can)	150 cal.
apple (one)	60 cal.

Calorie Use (Samples)	
walking	7 cal./min.
cycling	6 cal./min.

Calorie counts will vary according to brand, size of serving, etc.
See: SemCalc software by Sunburst (dimension analysis)

Headline: How Sweet It Is!



Your editor is on a health kick so you need some data for an article on eating and exercise.

One chocolate chip cookie has about 50 calories, and running burns up 20 calories per minute ($\frac{20 \text{ cal}}{1 \text{ min}}$). How many minutes of running each day would be needed to burn off 2 after school cookies?

1 ccc (chocolate chip cookie):

$$50 \text{ cal} \div \frac{20 \text{ cal}}{1 \text{ min}} = 50 \text{ cal} \times \frac{1 \text{ min}}{20 \text{ cal}} = \frac{50 \text{ cal}}{20 \text{ cal}} \times 1 \text{ min} = 2.5 \text{ min}$$

2 ccc:

$$100 \text{ cal} \div \frac{20 \text{ cal}}{1 \text{ min}} = 100 \text{ cal} \times \frac{1 \text{ min}}{20 \text{ cal}} = \frac{100 \text{ cal}}{20 \text{ cal}} \times 1 \text{ min} = 5 \text{ min}$$

You'll complete the charts (using mental computations as much as possible) to see how much running will be needed to compensate for these snacks.

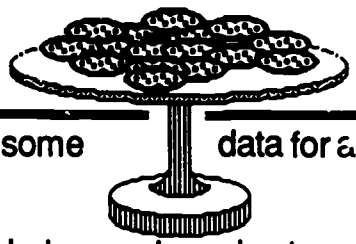
Cookies	Calories	Minutes
1	50	2.5
2	100	5
3	150	7.5
5	250	12.5
10	10 fifties 500 or 5 hundreds	Think 10 x 2.5 or 5 x 5 25
1 dozen	600	30
20	1000	50

Cookies	Calories	Minutes
24	1200	60
50	2500	125 or 2 hrs 5 min
30	1500	75 or hr 15 min
3 dozen	1800	90 or 1 hr 30 min
16	800	40
70	3500	175 or 2 hrs 55 min
100	5000	4 hr 10 min

If 3500 calories result in one pound added to your weight, how many cookies is that? 70 cookies What is the number of running minutes needed to burn off those calories? 175 minutes
If you eat 2 cookies a day, and make no other changes in diet or exercies, how many days before you will gain that pound? 35 days

What will be the "moral of your story"? Is it wise to eat that snack? What will the cost (in pounds) be?

Headline: How Sweet It Is!



Your editor is on a health kick so you need some data for an article on eating and exercise.

One chocolate chip cookie has about 50 calories, and running burns up 20 calories per minute ($\frac{20 \text{ cal}}{1 \text{ min}}$). How many minutes of running each day would be needed to burn off 2 after school cookies?

1 ccc (chocolate chip cookie):

$$50 \text{ cal} \div \frac{20 \text{ cal}}{1 \text{ min}} = 50 \text{ cal} \times \frac{1 \text{ min}}{20 \text{ cal}} = \frac{50 \text{ cal}}{20 \text{ cal}} \times 1 \text{ min} = 2.5 \text{ min}$$

2 ccc:

$$100 \text{ cal} \div \frac{20 \text{ cal}}{1 \text{ min}} = 100 \text{ cal} \times \frac{1 \text{ min}}{20 \text{ cal}} = \frac{100 \text{ cal}}{20 \text{ cal}} \times 1 \text{ min} = 5 \text{ min}$$

You'll complete the charts (using mental computations as much as possible) to see how much running will be needed to compensate for these snacks.

Cookies	Calories	Minutes
1	50	2.5
2	100	5
3		
5		
10	10 fifties or 5 hundreds	Think 10 x 2.5 or 5 x 5
1 dozen		
20		

Cookies	Calories	Minutes
	1200	
50		
	1500	
3 dozen		
		40
	3500	
		4 hr 10 min

If 3500 calories result in one pound added to your weight, how many cookies is that? _____ What is the number of running minutes needed to burn off those calories? _____

If you eat 2 cookies a day, and make no other changes in diet or exercies, how many days before you will gain that pound? _____

What will be the "moral of your story"? Is it wise to eat that snack? What will the cost (in pounds) be?

Headline: Is It Worth It?

With your appetite, this is a potentially serious situation. You had better investigate other forms of exercise and different snacks to keep that weight under control. You need more data.

SNACK ITEM	CALORIES PER SERVING	EXERCISE	CAL / MIN. BURNED

$$\square \text{ Cal.} \div \frac{\square \text{ Cal.}}{1 \text{ min.}} = \square \text{ Cal.} \times \frac{1 \text{ min.}}{\square \text{ Cal.}} = \frac{\square \text{ Cal.}}{\square \text{ Cal.}} \times 1 \text{ min.} = \square \text{ min.}$$

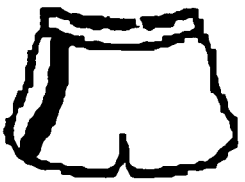
Number of Servings	Calories	Min. of Exercise Needed
1		
2		
3		
5		
10		
1 Dozen		
20		

Number of Servings	Calories	Min. of Exercise Needed
	1200	
50		
	1500	
3 Dozen		
		40
	* 3500	
		4 Hrs. 10 Min

* ☐ _____ will produce one pound (3500 calories).
snack item

☐ minutes of _____ will be needed to eliminate that pound.
exercise

What will be your plan for keeping weight in control? What will you munch? How will you exercise?



EDITOR'S NOTES

TITLE: Fans' Favorites

NATURE OF ACTIVITY: Survey, Circle Graph

OBJECTIVES: To survey two groups of 20 people to gather statistics for graphing
To change fractions to percents
To color and label a circle graph showing estimated results

PRE-SKILLS: Finding equivalent fractions (converting from denominators of 20 to denominators of 100), writing fractions with denominations of 100 in percent form

MATERIALS: Colored markers (optional)

NOTES: Students may wish to survey other classes to get different results for comparison. Teacher may wish to review finding equivalent fractions and changing to percents. "Circle Percentages" may lead to class discussion to insure accuracy before graphs are started. (Think of a quarter as half of a half and an eigth as half of a quarter.) The circles are pre-marked in eighths (12 1/2%), but students are expected to estimate the portion to be colored for each of their percents. Giving reasons (orally or in writing) for the three prediction graphs is important to encourage thinking. Stress fraction to decimal conversions without long division.

Example: $\frac{3}{20} = \frac{?}{100}$

FURTHER DISCUSSION / FOLLOW-UP: Discuss factors that could affect such a survey. Students may wish to test some of their ideas by surveying different age groups, different times of the year, etc. More advanced students may find actual degree measurements ($15/100 = n°/360°$) to match their results and then graph using protractors. Discuss ways to improve surveys by increasing the number of respondents, varying the selection procedure, etc. If students are all told to survey 20 different people, individual surveys could be combined to yield a large sample. The resulting circle graph could then be compared with individual graphs.

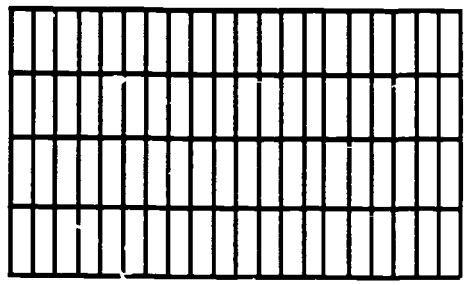
Discuss "exit poll" surveys where survey results are used to predict voter trends.

See Percent Manipulative in Press Kit.

Headline: FANS' FAVORITE

Your editor values the feeling of the "man on the street". He has asked you to do a quick survey of the sports fans to get their feeling about Boston area teams so he can better plan what kinds of features to write. You think he will have a clearer picture if you represent the percentages using a circle graph.

- Survey 20 people
- Ask them to choose their favorite Boston area team
- Color one box for each response
- Write a fraction (out of 20) for each team
- Enter your tallies in the chart below (first column)



First Twenty Responses

Team	Number of votes	Fraction (out of 20)	Fraction with Denom. of 100	Percent
Bruins				
Celtics				
Patriots				
Red Sox				

Survey another 20 people (different from your first 20) and complete the following table.

Second Twenty Responses

Team	Number of votes	Fraction (out of 20)	Fraction with Denom. of 100	Percent
Bruins				
Celtics				
Patriots				
Red Sox				

Total Forty Respcnses

Team	Number of votes	Fraction (out of 40)	Fraction with Denom. of 100	Percent
Bruins				
Celtics				
Patriots				
Red Sox				

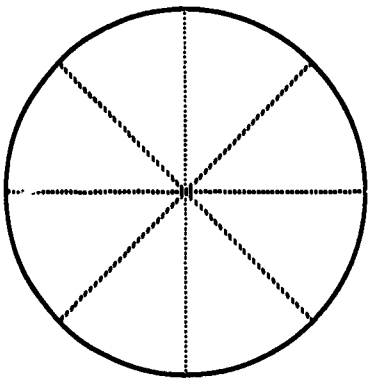
How do the preferences for your first group compare with your second group? If you surveyed another forty people, do you think the results would be exactly the same, nearly the same or dramatically different? Why?

Use the results of your first twenty responses to develop a circle graph.

Circle Percentages

Whole circle -____%
Half circle -____%
Quarter circle -____%
Eighth circle -____%

Use the marking on the circles to help you to estimate. Color and label the pieces for the four teams in your survey.

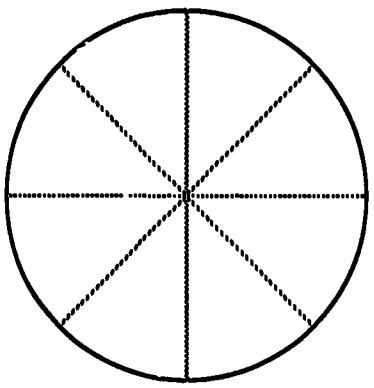


An appropriate title for the circle graph would be:

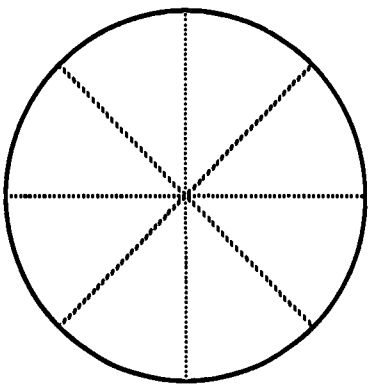
_____.

What do you think the graph would look like if :

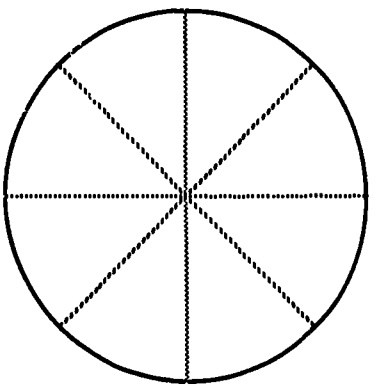
Your survey was done last semester?



Your survey was done in Western Massachusetts?



Your survey was done in an elderly housing complex?



What are three things that could affect the results of such a survey? What could you do to get a more representative survey?

EDITOR'S NOTES

TITLE: Picturing Percents

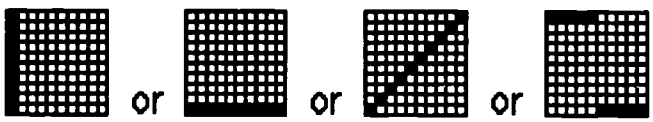
NATURE OF ACTIVITY: Inventing statistics and sketching related percentages

OBJECTIVES: To understand meaning of percent as "per hundred"
To represent percents visually on ten by ten grid

PRE-SKILLS: Familiarity with percent notation

MATERIALS: Ten by ten grids (optional), sports pages or magazines

NOTES: This is an introductory activity requiring few pre-skills. Discuss sample of a sport and percents that could be used (e.g. basketball free throw averages for particular team members). Brainstorming for examples may help to get students started. Allow students to look up percents (newspaper, etc.) or make them up. Discuss reasonable percents for certain activities. Is it very likely, unlikely, 50-50, etc? Require complete and descriptive titles. Share worksheets with the group after completion. Note the variety of ways by which a particular percent may be represented. Encourage originality.



10%

Discuss the "other" percent in each picture. Students need to think of a total of 100%.

FURTHER DISCUSSION / FOLLOW-UP: Use reverse thinking to discuss meaning of percent figures (e.g. 80% free throw average could mean 80/100 or 8/10 or 40/50 or 4/5 but 83% can only mean 83/100, 166/200, etc. unless rounding was used.) For "made up statistics," discuss how estimates were made (e.g. 20% of football passes for Pop Warner were completed--"I'm not a very good passer, I completed only 2 of 10 in my last game," etc.). The sportswriter (student) might write back to the teacher explaining his/her pictures. Displaying student work adds to classroom decor and rewards individual effort.

Headline: PICTURING PERCENTS

A recent letter to the editor came from a middle school math teacher who would like you to follow the guidelines below and complete the attached percent grids as a "professional" model for a class to follow. Your editor thinks that cooperating with the schools is good for public relations, so you will give it your best effort.

Picturing Percent Guidelines

1) Choose a sport or game that you like. It can be an individual or a team sport, a professional sport or one from your own experience.

2) Find or make up "six percent statistics" that could be related to the sport or game. Examples: Gymnastics: % of time I fell off balance beam, % of time I missed the vault
Hockey: % of saves for each of 6 NHL goalies, % of wins for 6 teams in league, % of goals (from shots on net) for 6 players

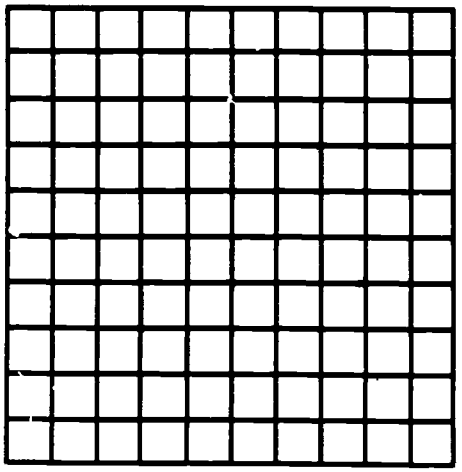
3) Use grid paper to picture each percent. Colors, cutouts, etc. may be used to make your paper more attractive.

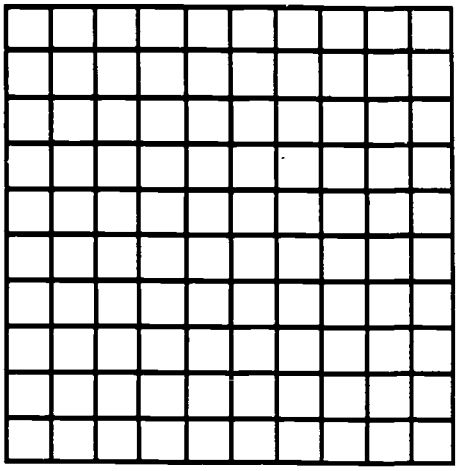
4) Your final paper must have...
   a) an overall title at the top (be general),
   b) a separate title for each percentage picture above the picture (be specific),
   c) six different percents (No more than three percents may be multiples of ten),
   d) your name in the lower right corner.

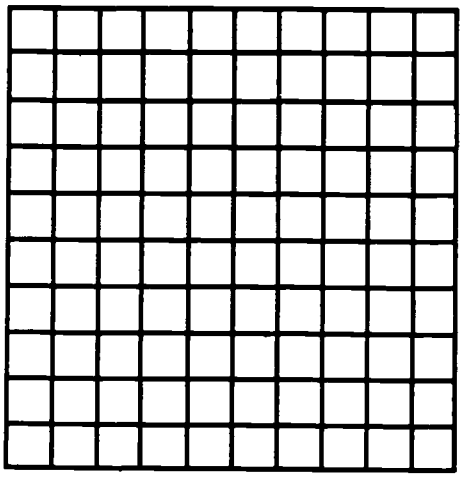
Be creative and use your imagination to come up with interesting percents.

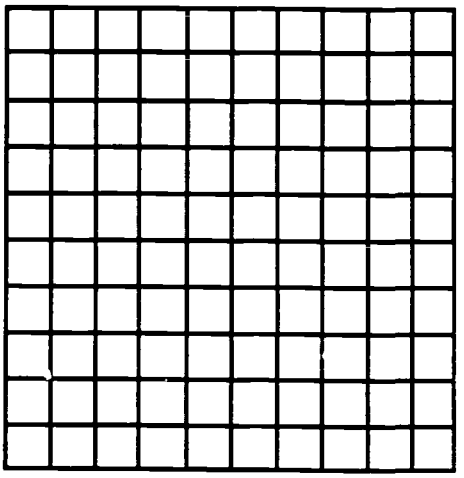
Will the student notice that each percent picture really shows two percents? What should the titles for the unshaded parts be?

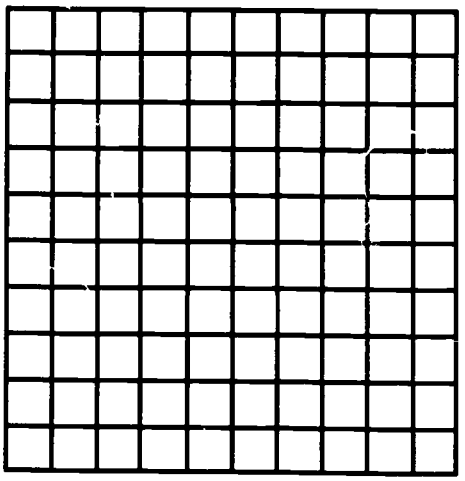
Picturing Percents

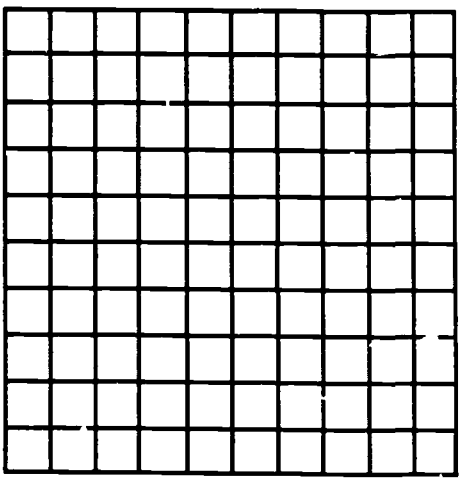




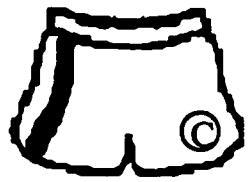








EDITOR'S NOTES



TITLE:That's Right, It's Left! **NATURE OF ACTIVITY**: Worksheet

OBJECTIVE: To visualize percent on a 10 x 10 grid
To change from fraction to decimal to percent form
To build equivalent ratios

PRE-SKILLS: Rounding decimals, changing from fractions to decimal form

MATERIALS: Grids

NOTES: Teacher should discuss three methods for changing fractions to percents. The division method should be considered as a last resort.

Ex. $\frac{7}{20} = \frac{?}{100}$ (x5 above, x5 below) 35%

$\frac{6}{40} = \frac{3}{20} = \frac{?}{100}$ (x5 above, x5 below) 15%

$\frac{4}{23}$ $23\overline{)4.00}$ .17 (23, 170, 161, 9) $.17\frac{9}{23}$ 17%

The golf and baseball examples involve division by a three digit divisor. A calculator could be used here or ratios could be estimated since the grid pictures require approximations anyway.

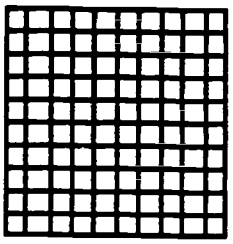
Ex. $\frac{140}{420} = \frac{1}{3} = \frac{33\frac{1}{3}}{100}$ (Shade 33 1/3 boxes) About what will 129/431 be?

$\frac{1}{300} = \frac{\frac{1}{3}}{100}$ (Shade 1/3 of a box) Will 1/350 be more or less than that?

Discuss whether or not the percent figures would be sufficiently accurate to use for manufacturing purposes. Is the percent of left-handed recreational athletes different from the percent of left-handed professional athletes? Students should be able to justify their guesses using their knowledge of a youth team, professional team, similarity to another sport, etc. Even encourage far out ideas, but require thinking! Focus on "manufacturing" section as an exercise in building equivalent fractions with denominators that are multiples of 100. Discuss why the percents might be so different from one sport to the next. Does available equipment influence a child's preference? Is right-handedness encouraged? Are their other factors to consider?

FURTHER DISCUSSION / FOLLOW-UP: Students may survey different populations (youth teams, school teams, etc) for comparing statistics of left-handers. Displays of grids could be used as a bulletin board. Local sports manufacturers could be surveyed to find out how they make decisions (independent surveys, industry standards, sales records, etc).

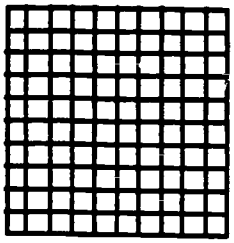
TENNIS 4/10



decimal .4

percent 40%

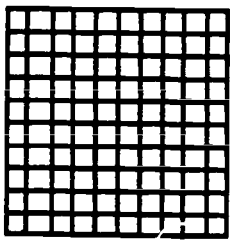
BOWLING 380/1900



.2

20%

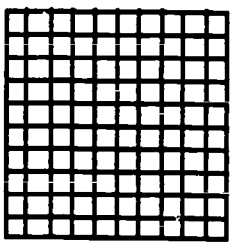
FOOTBALL 2/28



.07

7%

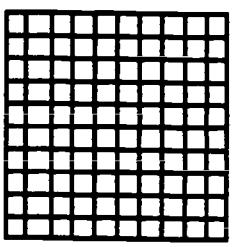
BASEBALL 129/431



.30

30%

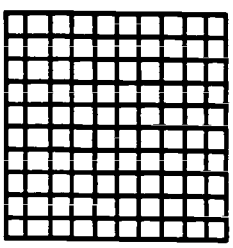
GOLF 1/350



.003

.3%

MY GUESS FOR HOCKEY



percent _____

Perhaps sporting goods manufacturers could use your data in planning for production.

Baseball: 30 % lefthanders

For every 100 gloves, 30 left 70 right

For every 1,000 gloves 300 left 700 right

For every 200 gloves, 60 left 140 right

For every 10,000 gloves, 3000 left 7000 right

For every 5,000 gloves, 1500 left 3500 right

For every 100,000 gloves, 30,000 left 70,000 right

Golf: .3 % lefthanders

For every 1,000 sets of clubs,

3 left 997 right

For every 10,000 sets of clubs,

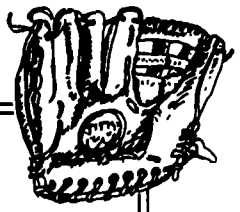
30 left 9970 right

For every 15,000 sets of clubs,

45 left 14,955 right

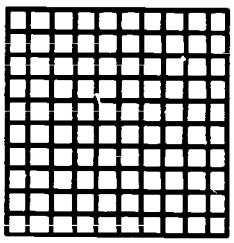
How do the sports percents compare with the 10% figure for the general population? Which is closest, furthest away? What could be some reasons for the differences?

Headline: THAT'S RIGHT; IT'S LEFT!



To settle a bet with another sportswriter, you need some data about the percentage of lefthanders in professional sports and how closely those percents compare with the percentage of lefthanders in the general population. Your friend will have a clearer picture if you use percent grids.

Approximately 10% of the general population is left-handed. Survey your class to find the percent in the class. Shade the grids to represent each of the percents.



Lefthanders in General Population

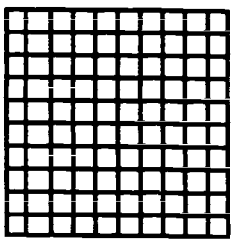
class size ___

lefthanders ___

ratio ___

decimal ___

percent ___



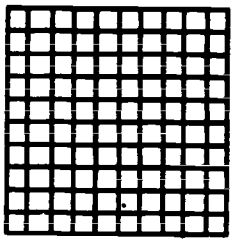
Lefthanders in class

A recent survey uses the following fractions to indicate how many **lefthanders** are represented in some familiar professional sports. Convert each of these to decimal, then percent form. Round all decimals to the nearest hundredth. Shade the grid on the next page. A calculator may be helpful.

PROFESSIONAL BASEBALL PITCHERS	BOWLING (PBA MEMBERS)	PROFESSIONAL TENNIS (MENS')
$\frac{129}{431}$	$\frac{380}{1900}$	$\frac{4}{10}$

GOLF (MENS') (LEADING MONEY WINNERS)	FOOTBALL (NFL QB)
$\frac{1}{350}$	$\frac{2}{28}$

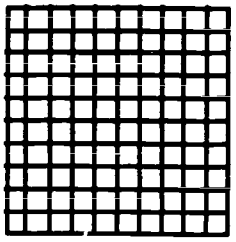
TENNIS 4/10



decimal _____

percent _____

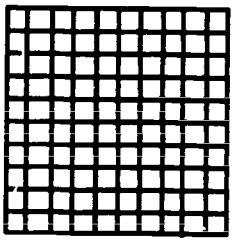
BOWLING 380/1900



_____

_____

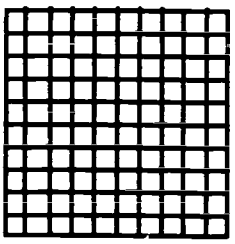
FOOTBALL 2/28



_____

_____

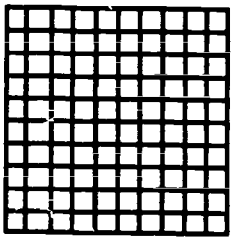
BASEBALL 129/431



_____

_____

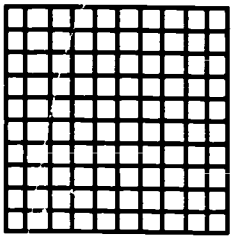
GOLF 1/350



_____

_____

MY GUESS FOR HOCKEY



percent _____

Perhaps sporting goods manufacturers could use your data in planning for production.

Baseball: _____% lefthanders

For every 100 gloves, ____ left ____right

For every 1,000 gloves ___ left ____ right

For every 200 gloves, ____ left ___ right

For every 10,000 gloves, ___ left ___ right

For every 5,000 gloves, ___left ___ right

For every 100,000 gloves, ___ left ___ right

Golf: _____% lefthanders

For every 1,000 sets of clubs,

___ left ____ right

For every 10,000 sets of clubs,

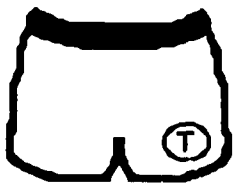
___ left ___ right

For every 15,000 sets of clubs,

___ left ___ right

How do the sports percents compare with the 10% figure for the general population? Which is closest, furthest away? What could be some reasons for the differences?

EDITOR'S NOTES



TITLE: Sale or Scam I, II **NATURE OF ACTIVITY:** Worksheets (2)

OBJECTIVES: To practice computations with money
To find percent discount

PRE-SKILLS: Calculator experience, rounding to hundredths, computations with money

MATERIALS: Sporting Goods store flyer, calculator (part I)

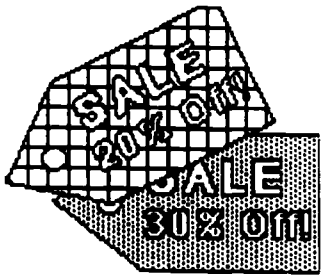
NOTES: Flyers for stores such as Colman's and Herman's are free in the mail or available as inserts in newspapers. Large quantities are also available at the local stores. Flyers for other department stores selling sporting goods can be used for this activity.

Part I - Students may choose any items where original price, sale price, and percent of discount are all given. In some cases the dollar am unt saved will be given. Often a given percent headlines the entire sale. Teacher may need to review rounding and conversion of calculator display to percent. Have students "re-do" page by using the store's percent to calculate the sale price. Compare results.
Part II - Students should be encouraged to use scrap paper for planning. A sales tax chart may be used so the activity can be done without a calculator. This is a template activity which can be used again with new sales information.

FURTHER DISCUSSION / FOLLOW-UP: Part II can be done as a competitive activity with awards for the student spending the closest to $800.00 without going over. Teacher may discuss the various types of rounding with money that may be used (always up, always down, sometimes up, sometimes down) Which would a store use? Which would the consumer prefer?

Discuss how sales prices might be determined and why. (Set the dollar discount and then compute percent or establish a percent figure and then compute the new price.) Have students give examples of situations where each might be practicai. Discuss shortcuts for mentally computing certain common examples of "percent off" (20%, 25%, 15%, etc.).

Headline: Sale or Scam I



Your paper has a policy of spot checking the claims of all its advertisers. The sports department must investigate the sporting goods advertisers, and it's your turn to check out whether or not the things they say are accurate. You will give your report to the consumer editor.

Use your flyer to check the accuracy of the discounted items. Choose items where original price, sale price, and percent of discount are all given.

Name of store:_____

1. Using the original price of the _____ on page ____ and the sale price of _____, compute the percent discount.

Original Price
- Sale Price
Amount Saved

Amount saved ÷ Original Price
% discount

You Get:_____%
They Say:_____%

2. The _____ on page ____ are on sale for _____.

They were originally _____. Compute the percent discount.

You Get:_____%
They Say:_____%

3. The _____ on page ____ were originally _____

but are on sale for _____. Find the percent discount.

You Get:_____%
They Say:_____%

4. The _____ on page ____ were originally ____ _____

but are on sale for _____. Find the percent discount.

You Get:_____%
They Say:_____%

What will you report for this store? Is the percent of discount accurate? If there are any differences, why? Is it a sale or a scam?

Headline: **SALE OR SCAM II?**

Because you have worked so hard on your consumer checks, your editor gave you an $800.00 bonus in the form of a gift certificate at HERMAN'S WORLD OF SPORTING GOODS. You want to try and spend it all, so you use the sales flyer to buy all the things you would like to have. Plan your shopping list carefully (perhaps a rough draft on scrap paper?) so you won't be embarrassed at the cash register.

Clothing (non-taxable items)

Item	Page	Original price	Sale price
Total spent	X		

→ [ ]

Taxable Items *(multiply total spent by .05 and round)

Item	Page	Original price	Sale Price
Total spent	X		
*5% Tax		+	+
Total Cost			

→ + [ ]

[ ]

$800.00

− [ ]

[ ]

Amount Left

How close to $800.00 did you come? How much money did you save? Is this really money saved?

EDITOR'S NOTES

TITLE: How Do You Rate? **NATURE OF ACTIVITY**: Project (poster or paper)

OBJECTIVES: To generate an awareness of statistics in sports
To create an interest in informal research
To provide a creative outlet for student interests

PRE-SKILLS: Some experience with decimals and percent, familiarity with averages, some experience with rounding decimals

MATERIALS: Poster materials (optional), sports magazines, fact or trivia books, almanacs, programs or yearbooks (optional)

NOTES: This is an introductory activity. Projects may be used as a starting point for a unit on decimal or percent or to generate ideas for original games for later class participation. Working through the plan for sample poster or paper with the class could serve as an example. Focus student attention on mathematical aspects such as scoring, recording of statistics, records, etc. If project is to be graded, criteria should be reviewed. Items might include:

Amount of math used (scoring, recording, keeping stats, etc.)
Accuracy of math used
Clarity of explanations
Neatness and organization
Originality or creativity

FURTHER DISCUSSION / FOLLOW-UP: Poster or papers may be displayed and ratings or statistics discussed. The class may generate a bulletin board poster or chart entitled Sports Formulas (like the ERA example). Divide a large sheet of paper into sections for some well-known sports. Have students contribute formulas they have found with at least one numerical example for each type. Original games can be used as a basis for this culminating experience. See description of a Classroom Olympics activity. Also, discuss possible differences between sports usages and mathematical definitions of certain terms. Examples: Average-- Batting Average, Points Per Game Average, etc. Percent/Percentage-- Win - Loss Percentage, Free Throw/Field Goal Percentage, etc.

Headline: HOW DO YOU RATE?

What luck! You are one of the first to see the following guidelines for an upcoming contest. If you act quickly your entry will be among the first (and best?)

All sports have special statistics or ways of rating the performance of each participant. Most of these ratings are really fractions, rates, or ratios which are converted to decimal form and rounded to thousandths.

CHOOSE ONE OF THESF TWO PROJECTS:

1. POSTER:

Make an eye-catching poster (larger than 8-1/2"X11") about a sport and the way that sport rates the athletes' performances. Your poster must make obvious which sport you have picked. Your poster should include as many different kinds of ratings or statistics kept on players or participants as you can find. Your poster must explain how these ratings are calculated and give an example of such a rating. For example, in baseball ERA means "earned run average" and is a statistic used to rate pitchers' performances. It is calculated by finding the following quotient:

$$\frac{\text{number of earned runs X 9}}{\text{number of innings pitched}}$$

This decimal is then rounded to the nearest hundredth.

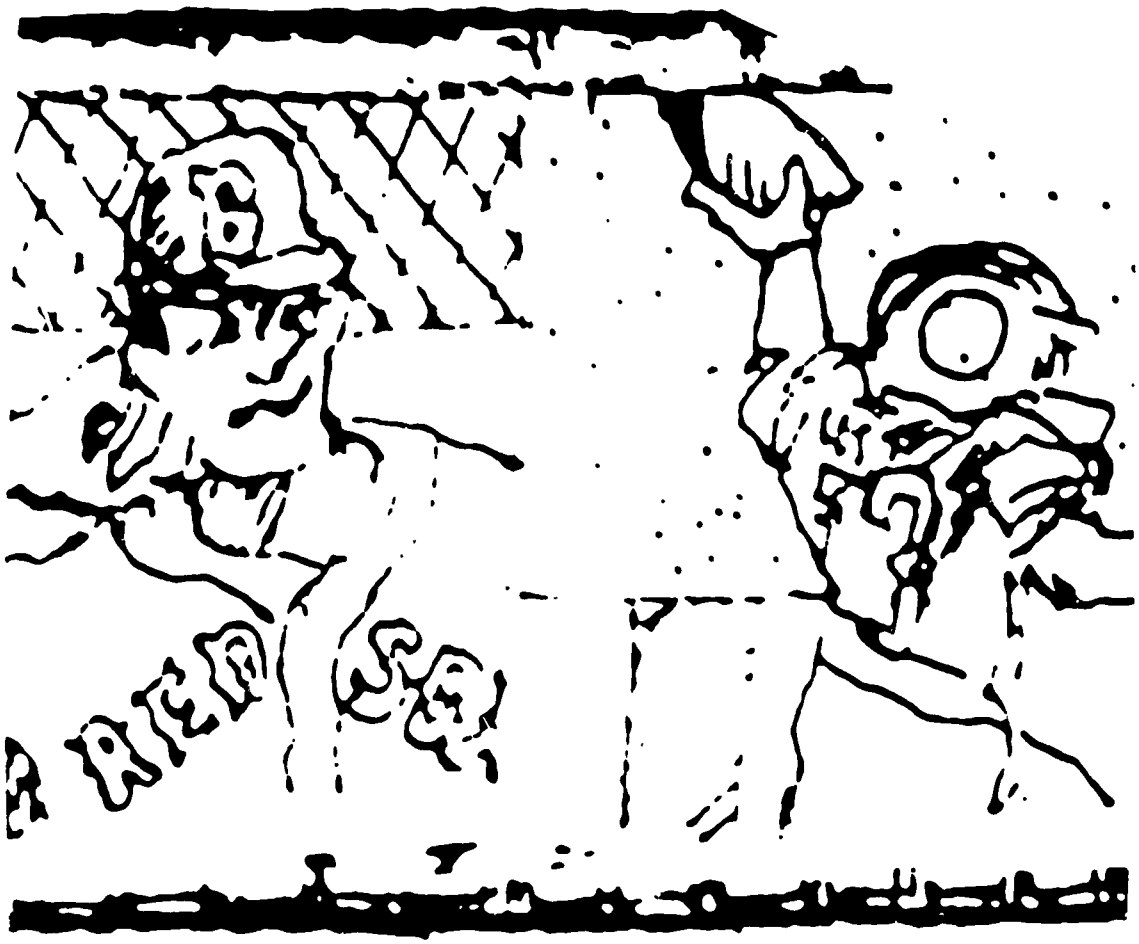
In 1968, Robert Gibson of the St. Louis Cardinals had a season ERA of 1.12. He pitched 305 innings. (How many runs were earned by his opponents?)

2. PAPER:

Here's your chance to be really original! Invent a sport or game of your own that might be included as an event in the "1987 Classroom Olympics". Write a short paper describing the sport. Establish well-thought-out rules. Invent one or more statistics or other means of calculating performance ratings of the participants. For example, suppose you invent an event called **PAPER CLIP STACKING** (20 paper clips). One rating could be CSA or "clip stacking average" calculated by dividing:

$$\frac{\text{total clips successfully stacked}}{\text{number of clips not stacked}}$$

Should there be a minimum number of clips stacked?

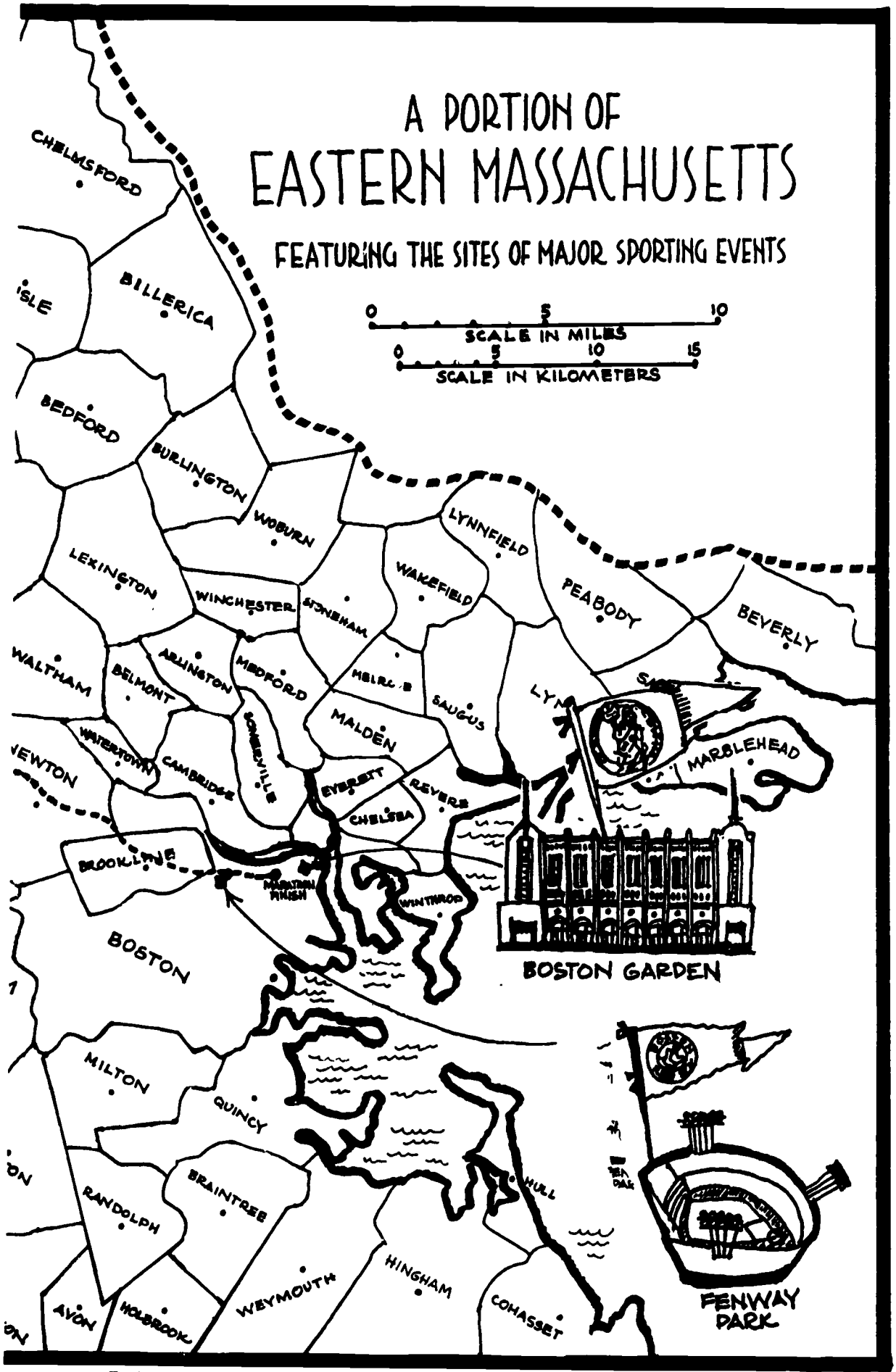


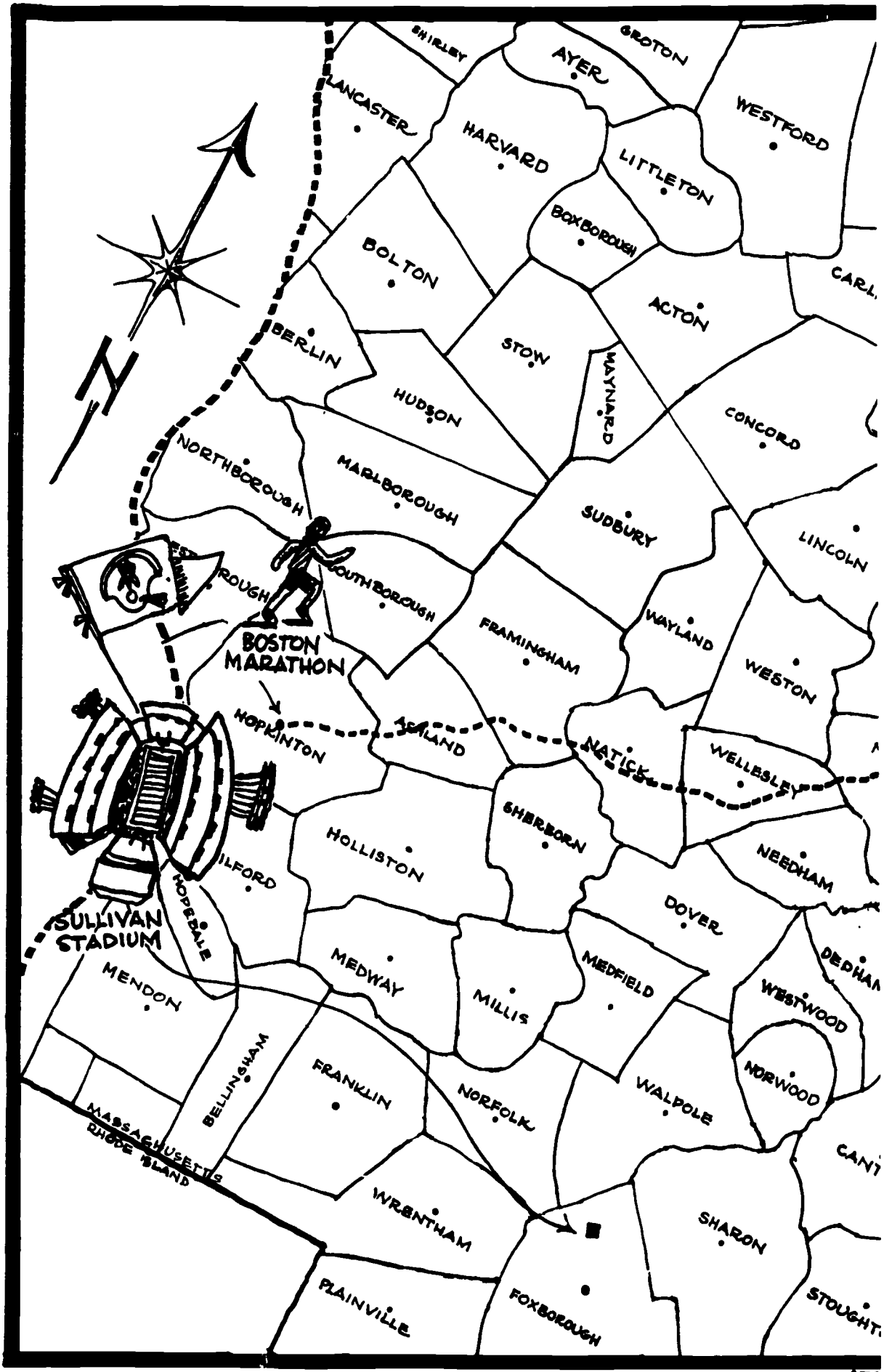
Teacher Resource Packet
"Press Kit"


Press
identification
Staff reporter for
Name
I.D.#
Event
Editor

207

208


A PORTION OF
EASTERN MASSACHUSETTS
FEATURING THE SITES OF MAJOR SPORTING EVENTS
0 5 10
SCALE IN MILES
0 5 10 15
SCALE IN KILOMETERS
CHELMSFORD
BILLERICA
BEDFORD
BURLINGTON
WOBURN
LEXINGTON
WINCHESTER
STONEHAM
WAKEFIELD
LYNNFIELD
PEABODY
BEVERLY
WALTHAM
BELMONT
ARLINGTON
MEDFORD
MALDEN
SAUGUS
LYNN
MARBLEHEAD
NEWTON
WATERTOWN
CAMBRIDGE
SOMERVILLE
EVERETT
REVERE
CHELSEA
BROOKLINE
BOSTON
WINTHROP
BOSTON GARDEN
MILTON
QUINCY
BRAINTREE
RANDOLPH
HULL
HINGHAM
WEYMOUTH
AVON
HOLBROOK
COHASSET
FENWAY PARK


SHIRLEY
GROTON
AYER
LANCASTER
HARVARD
WESTFORD
LITTLETON
BOXBOROUGH
BOLTON
ACTON
BERLIN
STOW
MAYNARD
HUDSON
CONCORD
NORTHBOROUGH
MARLBOROUGH
SUDBURY
LINCOLN
SOUTHBOROUGH
FRAMINGHAM
WAYLAND
WESTON
BOSTON MARATHON
HOPKINTON
NATICK
WELLESLEY
SHERBORN
HOLLISTON
NEEDHAM
ILFORD
DOVER
SULLIVAN STADIUM
MEDWAY
MEDFIELD
MILLIS
WESTWOOD
MENDON
FRANKLIN
NORFOLK
WALPOLE
NORWOOD
BELLINGHAM
MASSACHUSETTS
RHODE ISLAND
WRENTHAM
SHARON
PLAINVILLE
FOXBOROUGH

Headline: Around the Town

A map of Eastern Massachusetts has been included in **Sports Shorts** as a visual aid for locating the various sports activities that are mentioned. General suggestions follow for some sports related map activities. Overall goals include:

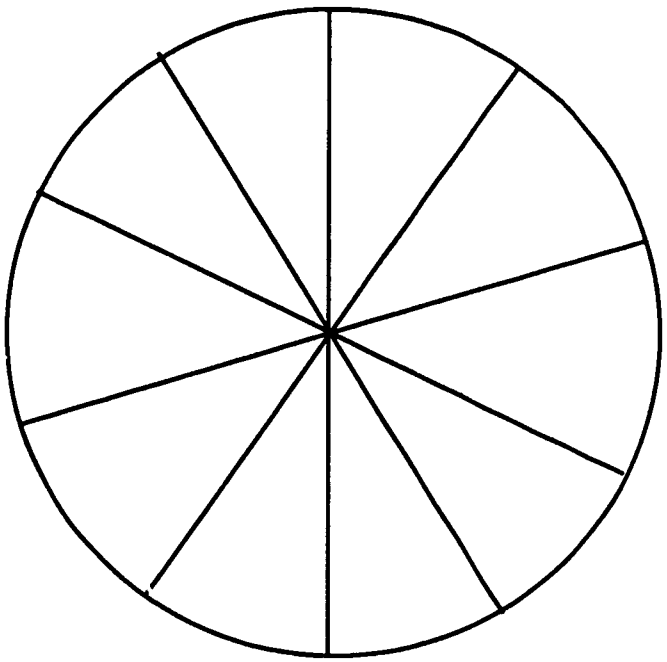
-Visualization of the Greater Boston Area
-Location of students' hometowns, sports facilities, and other landmarks
-Spatial awareness experience
-Improved map skills (N, S, E, W, scales, etc.)

Students & teacher creativity can further define the suggested activities as well as stimulate original ideas for similar experiences.

Objective	Skills	Suggestions for Activities
Reroute the Boston Marathon	Problem solving Measuring practice with money using scale	Change the existing route within parameters (distance, towns included or excluded, etc.) Change start or finish points Compute costs/expenses Determine prizes
Plan Youth Tournament	Problem Solving Combinations Efficient counting Practice with money	Select sport and teams (towns) to invite Set schedules for participants Plan extras (food, officials, prizes, etc.)
Make a Pin Map	Surveying Research Record Keeping Data Analyses	Research + locate hometowns of Boston area professional athletes Locate towns for championship high school teams (any sport(s)) Locate other sports related facilities (college, tracks, ski areas, etc.)
Plan itinerary	Problem solving Practice with money	Plan week(s) or month(s) itinerary for sports writer (high school, college, pro) Establish travel budget Plan "vacation" trip to see area game(s)

Play Game or Make puzzle	Computational practice Map skills Problem solving	Color map using fewest colors Cut out pieces (towns) or use markers to "win" as prizes for fact/trivia questions Describe towns by clues (10 mi N of ___, bordered by ___ on the West, etc.)
Relocate Sports Facility	Problem Solving Practice with money Research	Establish priorities for new location (accessibility, population, costs, etc.) Research transportation, population base, etc. Plan timetable for move Design facility Plan press release to publicize new move
Enlarge or Expand Map	Scale drawing Research Area measure	Locate other sports facilities in area (college, stadiums, ski areas, race tracks, etc.) Put in main routes (90, 128, 495, etc.) Estimate town areas using grid paper
Plan a class trip	Problem solving Research Practice with money	Brainstorm for place to go (skiing, bowling, sports event, etc.) Plan transportation + route Determine expenses (food, fees, transportation, etc.)

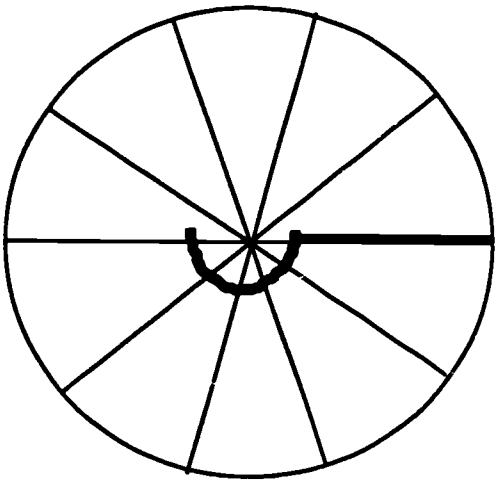
THE DECI-METER
(Manipulative)

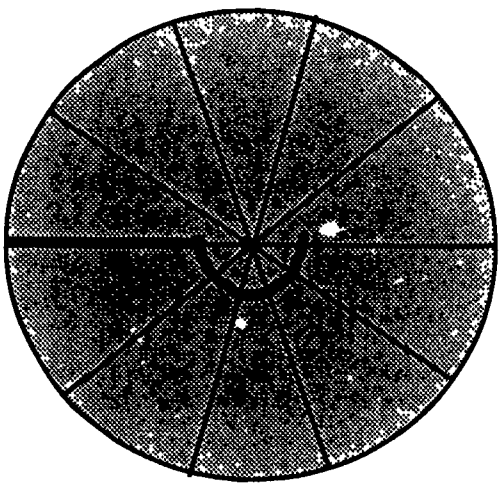


The Deci-Meter is a manipulative model for visually representing percent. The Meter is divided into ten sectors. Percents other than those that are multiples of ten can be approximated. The meter is an alternative model to the 10 x 10 grid as a visual image for parts out of 100. The meter can be used whenever class discussion relates to percent (particularly in problem solving). Individual meters (smaller in size) may be helpful to students who need concrete models for concepts.

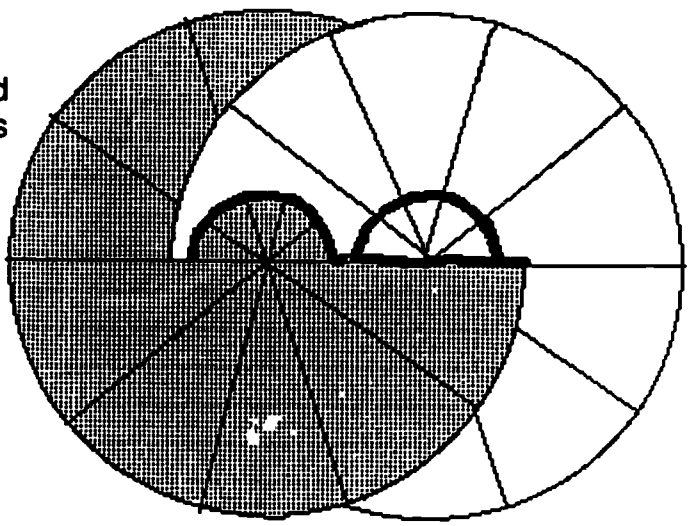
Directions for Making *The Deci-Meter* Manipulative

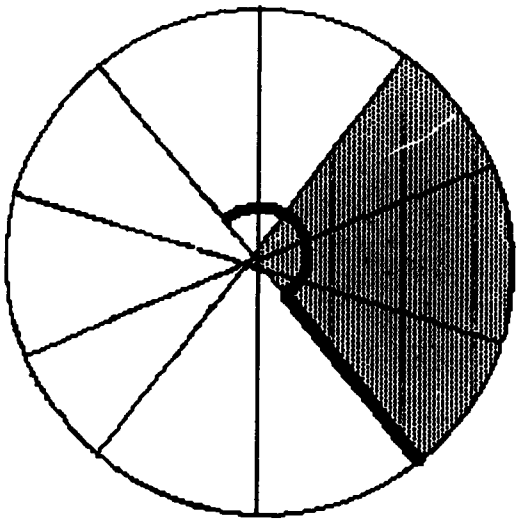
Using the template on the following page, cut out two circular wheels in contrasting colors. Cut as indicated by the darkened line below. Cut half way around the inner circle (which is the size of a gummed reinforcement).





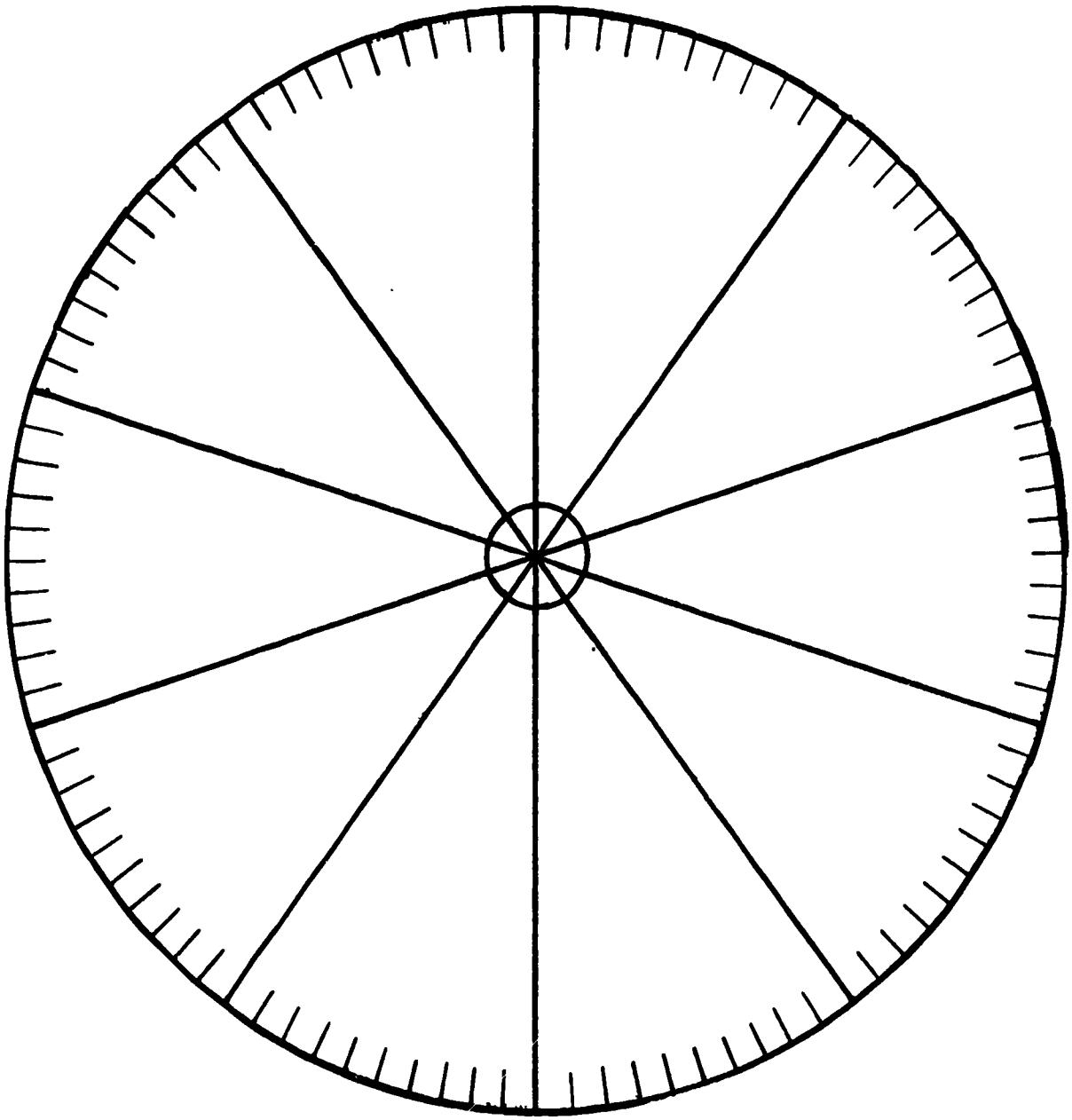
Strengthen each wheel with gummed reinforcements and slide the wheels together as pictured at right.





Fasten with a paper fastener and enjoy using as a visual aid.

The Deci-Meter could be made using fractions other than tenths. The Deci-Meters could be strengthened by laminating or by covering with clear contact paper.



Headline: PERCENT PUCKS

Percent Pucks are manipulatives to be used in games, demonstrations or displays.

Set contains:			
	23	shaded pucks	
	3	blank pucks	52 pieces
	23	labeled sticks	
	3	blank sticks	

The Percent Puck manipulatives can be used to illustrate percents, decimals and their equivalent fraction forms. All fractions are in lowest terms.

It is recommended that these materials be copied onto construction paper or oak tag. They also could be laminated.

Some students may need individual sets to aid them in working with percents.

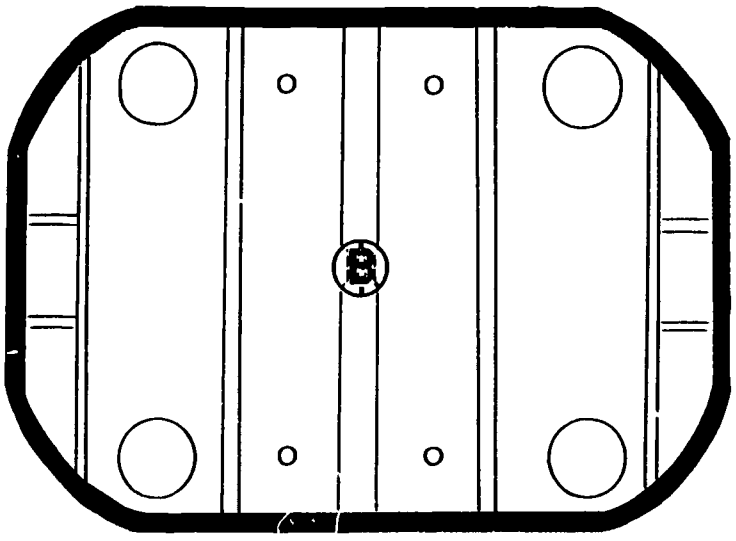
Suggestions for use:

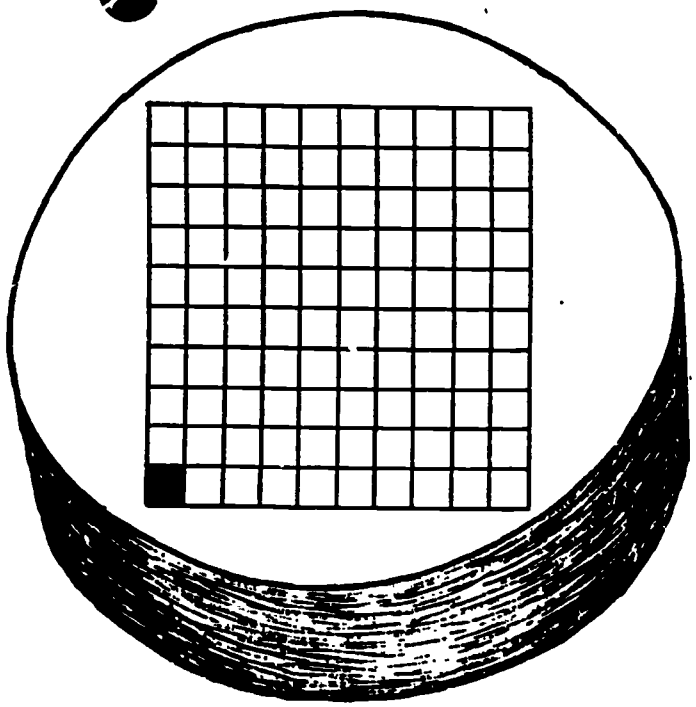
a) Flashcards
b) Bulletin Board
c) Concentration -- 3 to 5 players
- Pucks and sticks are laid face down on the table.
- One student turns over one stick and a puck.
- If the percent on the puck is equivalent to that pictured on the stick, the player has a match and may take another turn.
- If the student does not have a match, they put the puck and the stick back in their original places, and another player takes a turn.

d) War -- 2 or 3 players
- The set of percent pucks is divided up into even piles (pucks and sticks should be mixed and dealt randomly). Sitting so they face one another, students place their sticks and pucks in a pile, face down.
- Students turn over pieces from their pile simultaneously.
- Student with the greatest percent takes both pieces.
- If students turn over equivalent pieces, "war" is declared. Each player places 3 pieces face down on the table, then they turn over the fourth piece. The player with the greatest percent takes all the pieces on the table.

e) Pick the Stick -- 4 to 6 players
- All sticks are placed face up on the table.
- The pucks are placed face down in one pile.
- One person turns over the puck.
- Other players must find its equivalent stick.
- When a player finds the equivalent stick, the player places his hands over that stick and then takes the stick and the puck.
- Play continues until all sticks have been claimed.
- Player with the most sets is the winner.

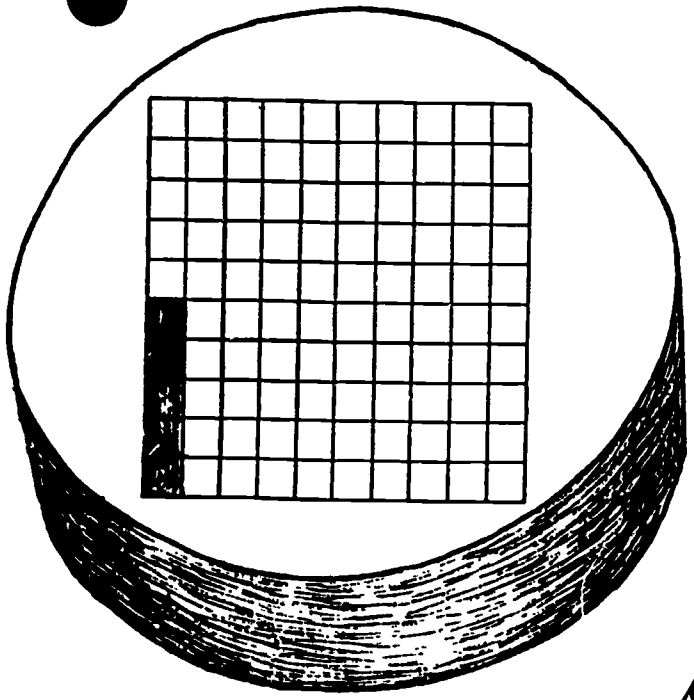
f) Play Hockey -- 2 to 4 players
- Reinforce the blank hockey sticks using popsicle sticks.
- Use the model below to re-create the Bruins arena on poster board.
- Use the game mat with pucks and sticks for original student games

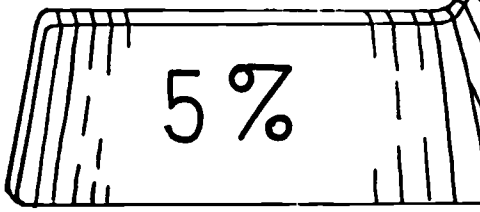


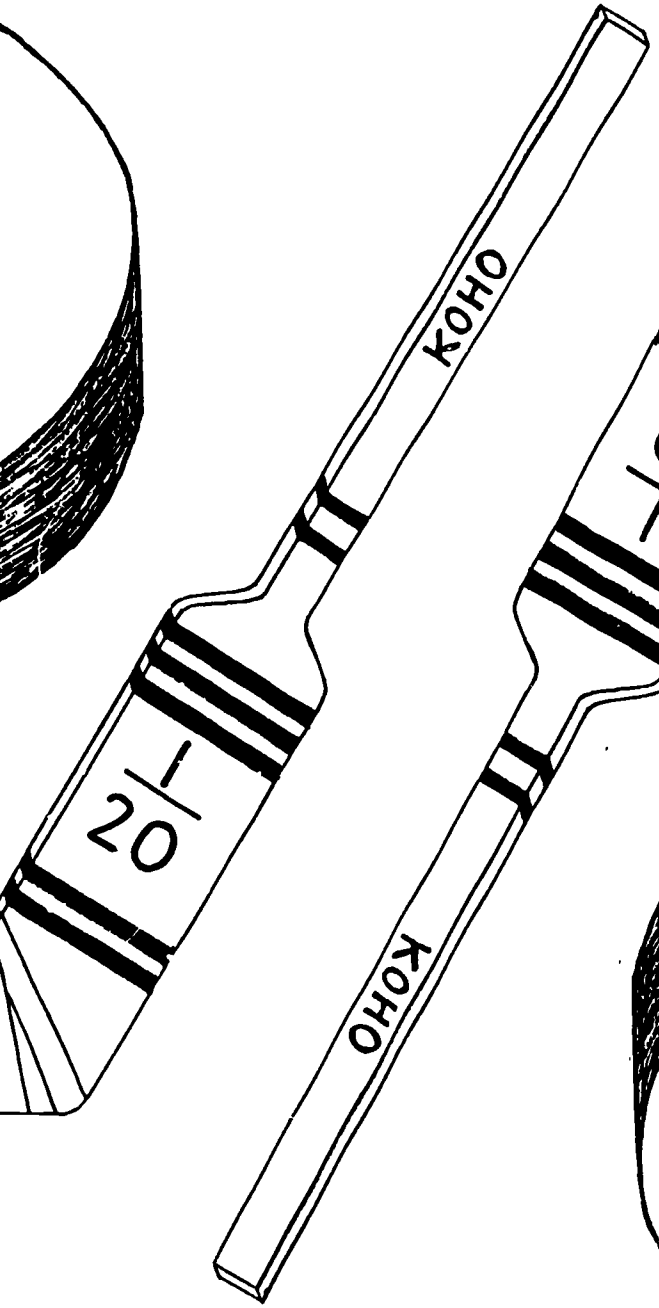


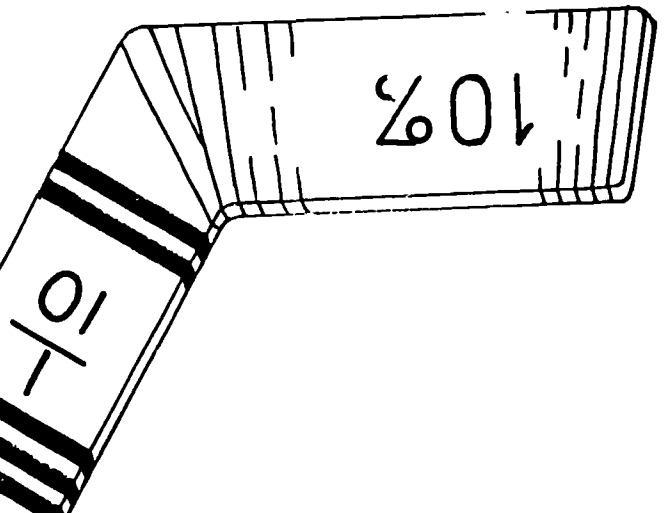
218

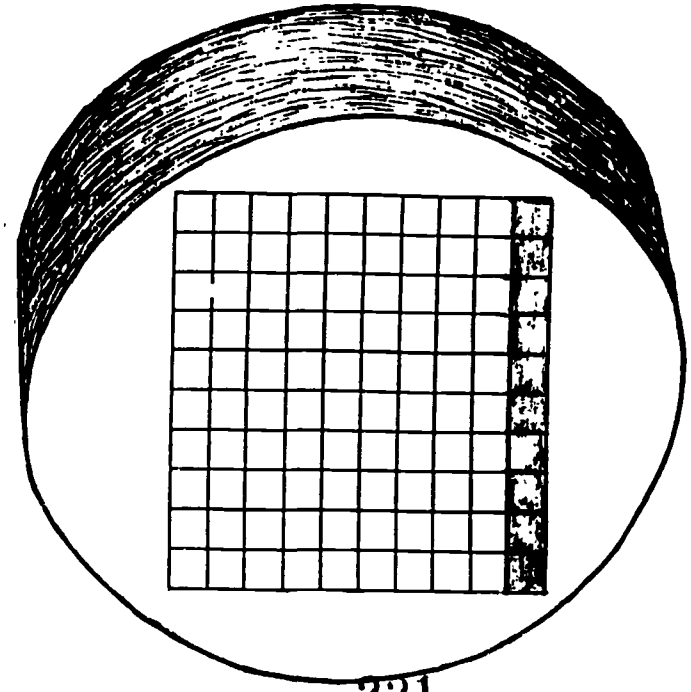
219




5%

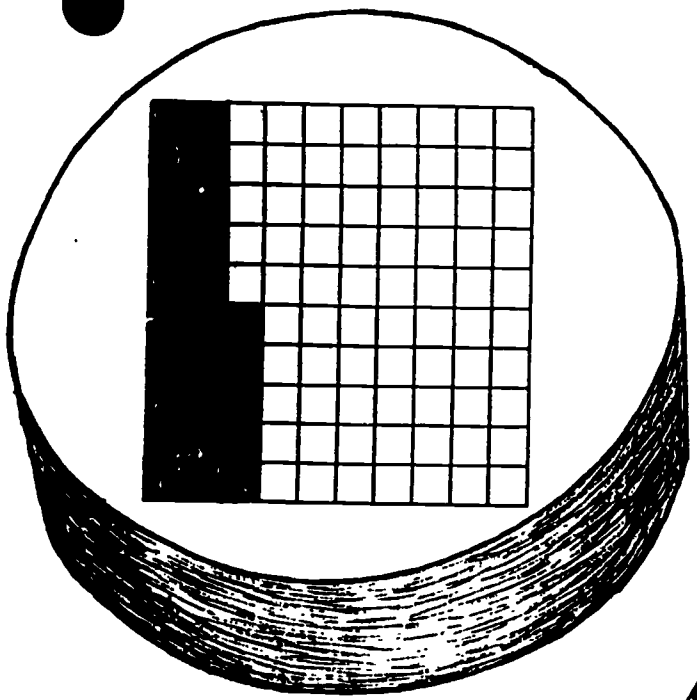

KOHO
1/20
KOHO
1/10


10%

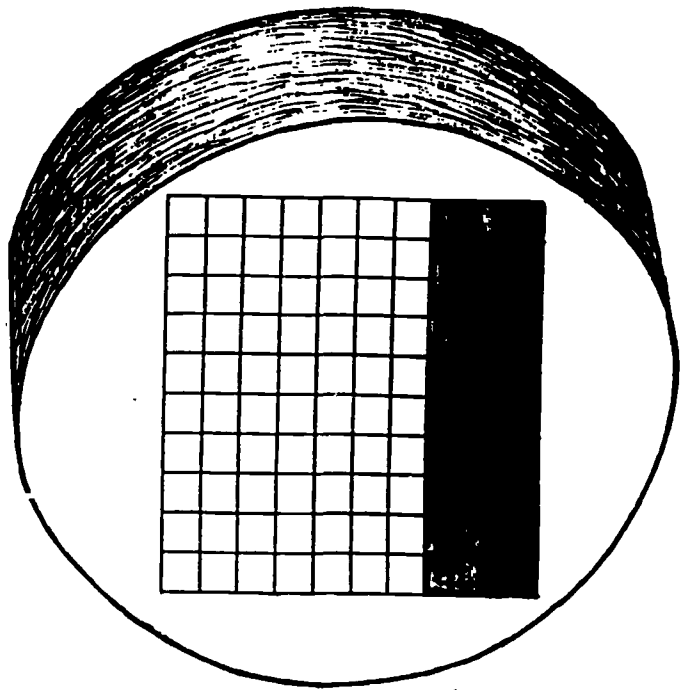


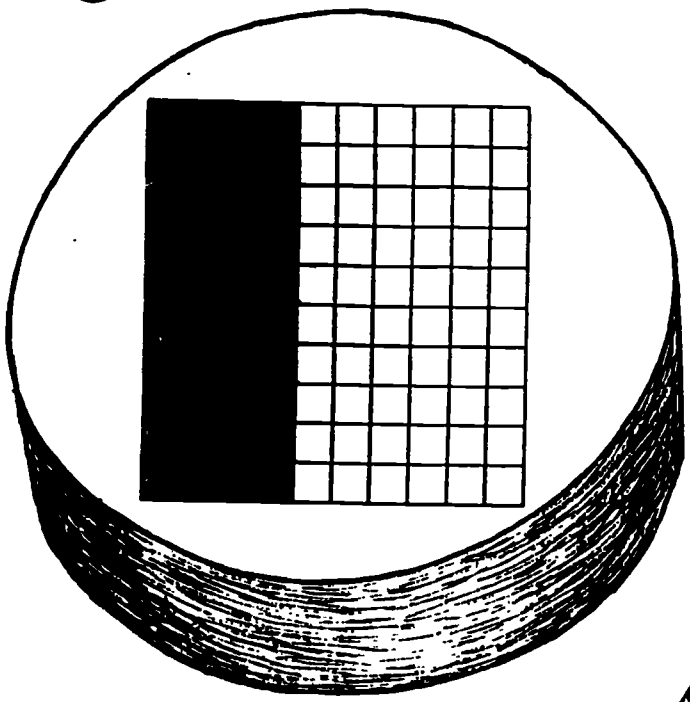
KOHO
2/3
15%

KOHO
1/5
20%

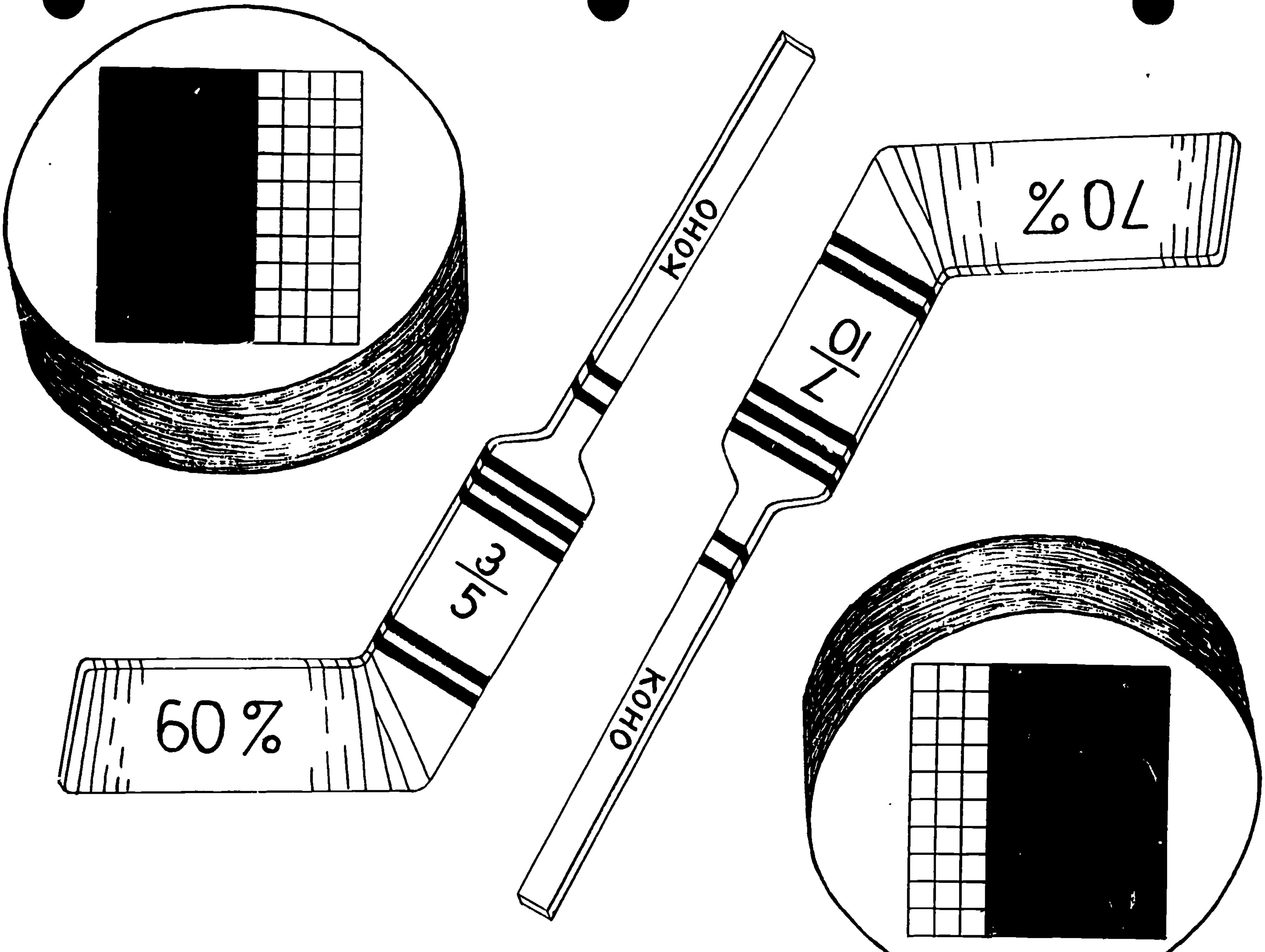


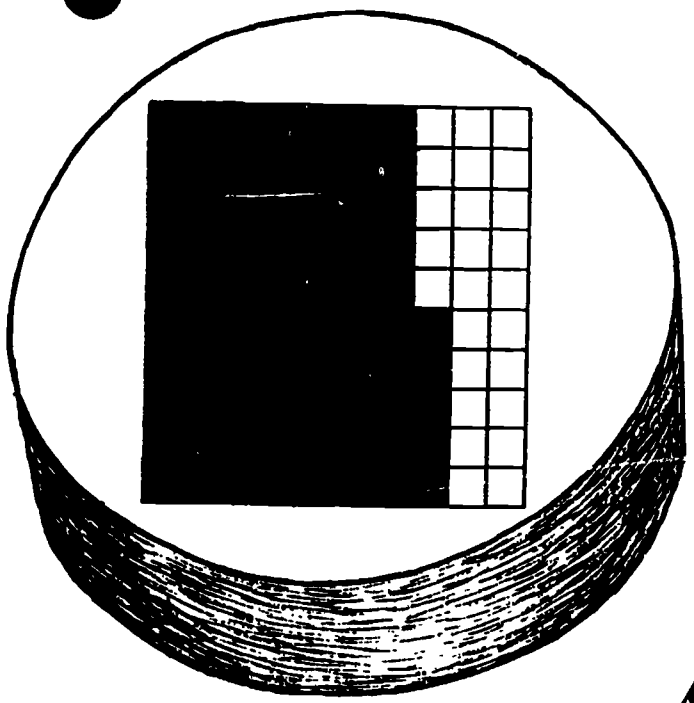
KOHO
1/4
25%
KOHO
3/10
30%



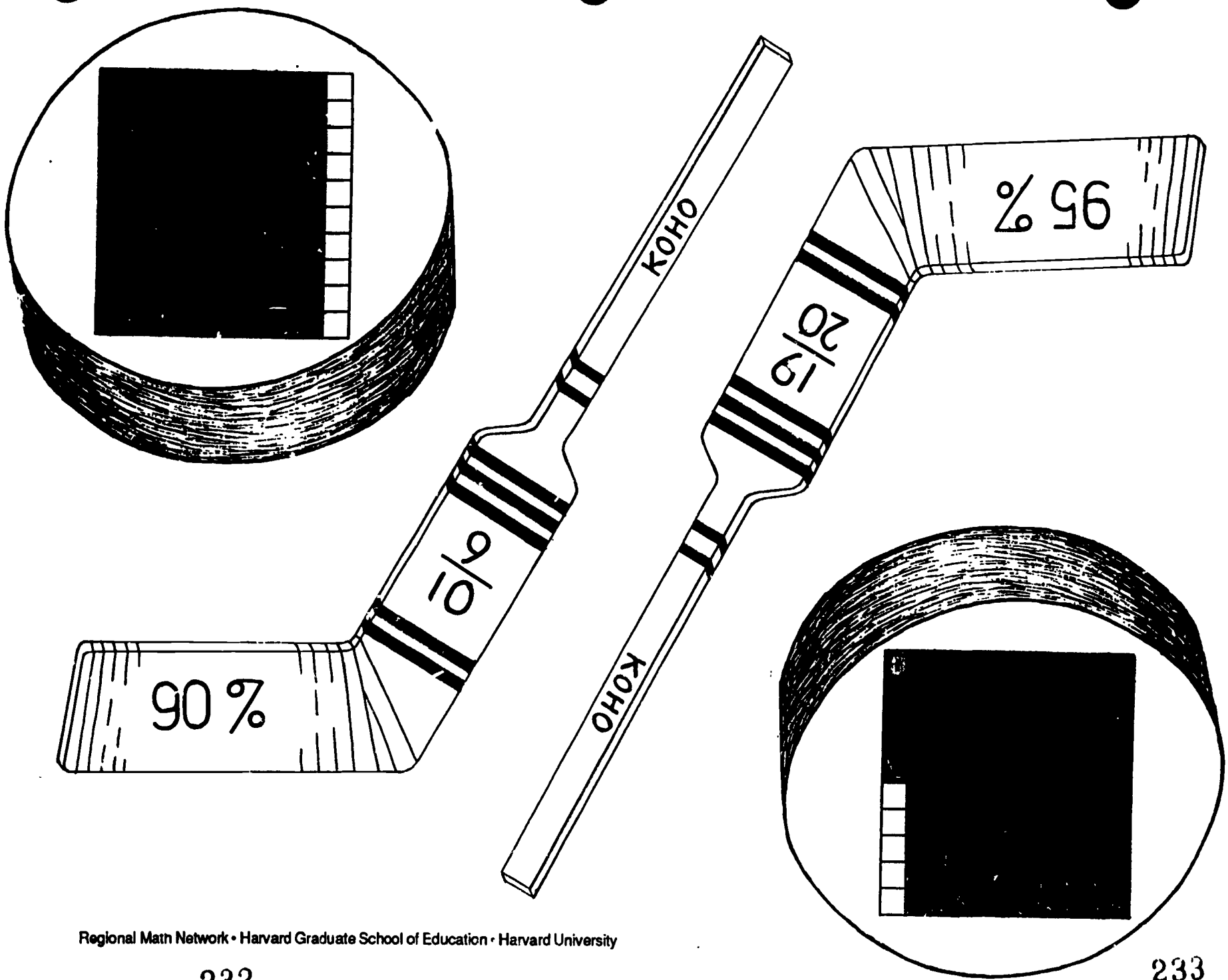


KOHO
KOHO
40%
50%


KOHO
70%
7/10
3/5
60%
KOHO



KOHO
KOHO
75%
80%
1/3
1/4
1/5


KOHO
KOHO
90 %
10%
10%
95 %

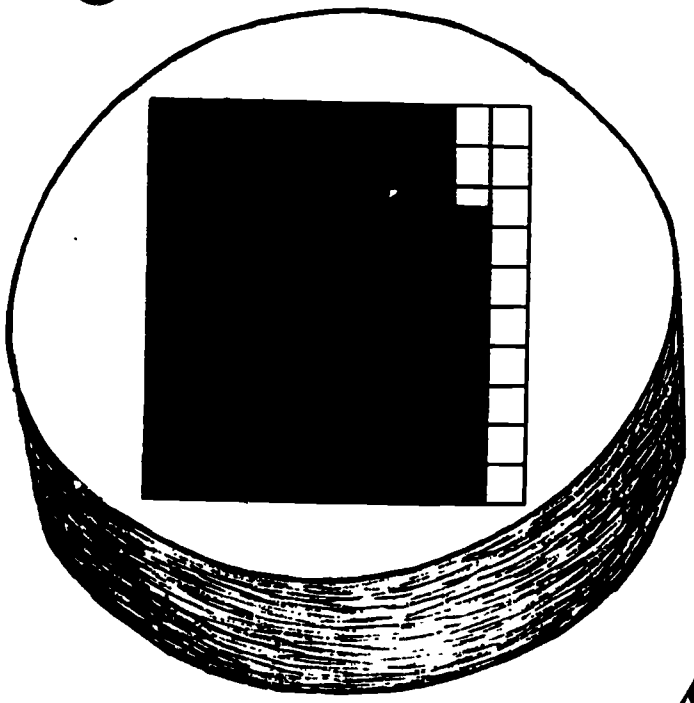
KOHO
1
100%

KOHO
1/3
33 1/3 %

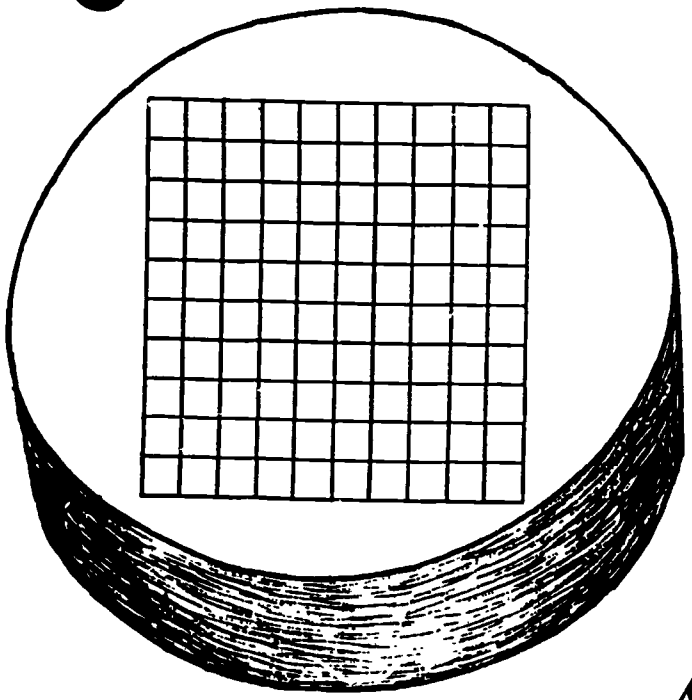
KOHO
KOHO

KOHO
3/8
37 1/2 %

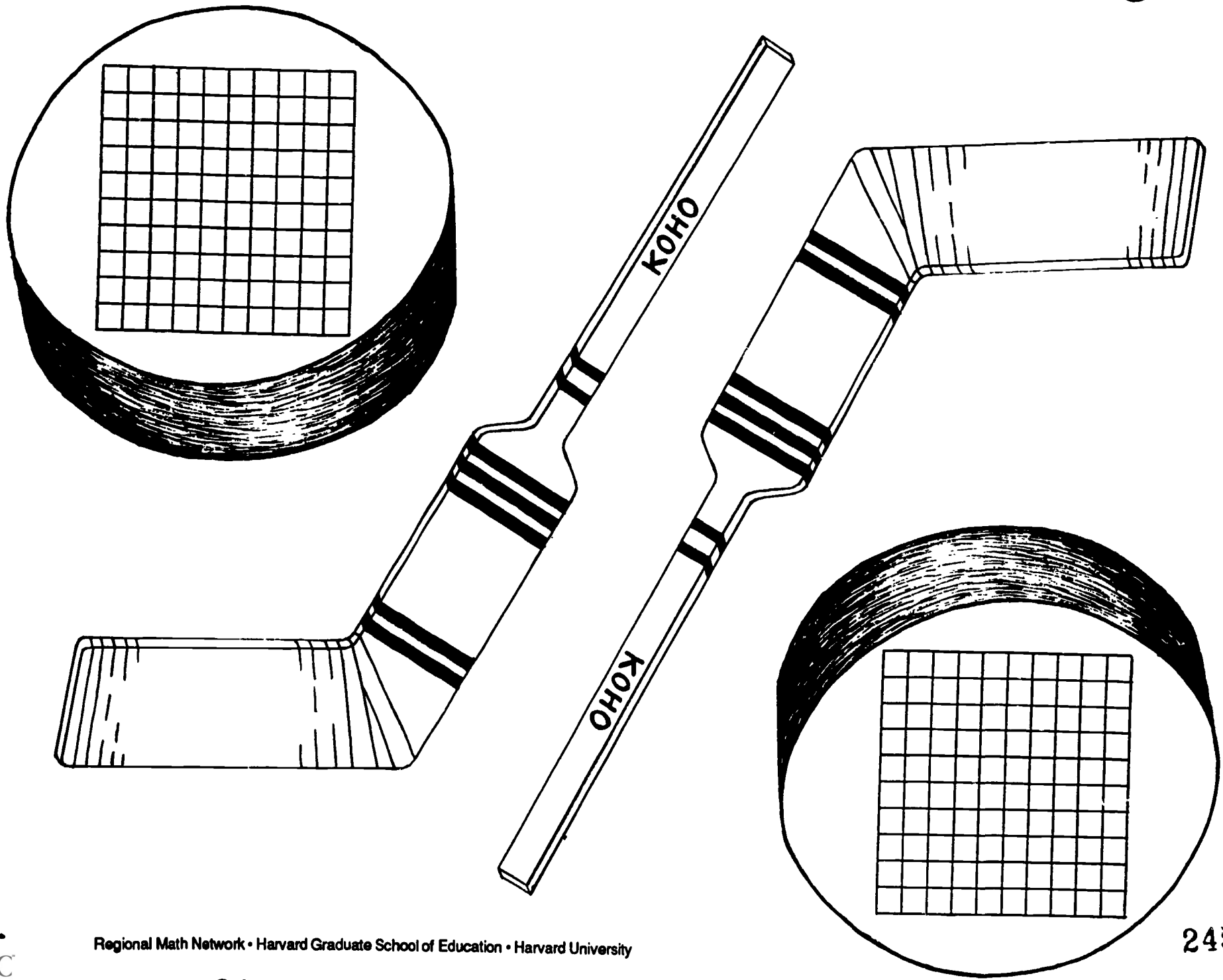
KOHO
5/8
62 1/2 %



KOHO
KOHO
%
1/8
87 1/2 %



KOHO
KOHO
9
9


KOHO
KOHO

Headline: It's All the Same to Me

(Teaching Suggestion)

Sheets like the one illustrated at the right may be used for regular drill and practice with common equivalents.

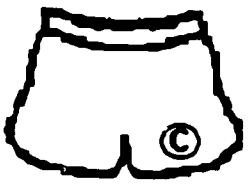
Such exercises help students see that the four entries in any row are all names for the same number. They also learn the ease in converting from a decimal to a percent or from a percent to a decimal.

Students can "square off" papers by folding vertically (4 columns) & horizontally (8 or 16 rows). Teachers can dictate entries or display them on an overhead. A series of blank forms with 4 columns and any number of rows can be prepared for regular review of common equivalents.

Simplified Fraction	Denom. of 100	Decimal	Percent
$\frac{1}{4}$	$\frac{25}{100}$	.25	25%
		.5	
	$\frac{12.5}{100}$		
$\frac{1}{5}$			
			150%
		.875	
	$\frac{90}{100}$		
$\frac{1}{3}$			

Headline: It's All the Same to Me

(Teaching Suggestion)



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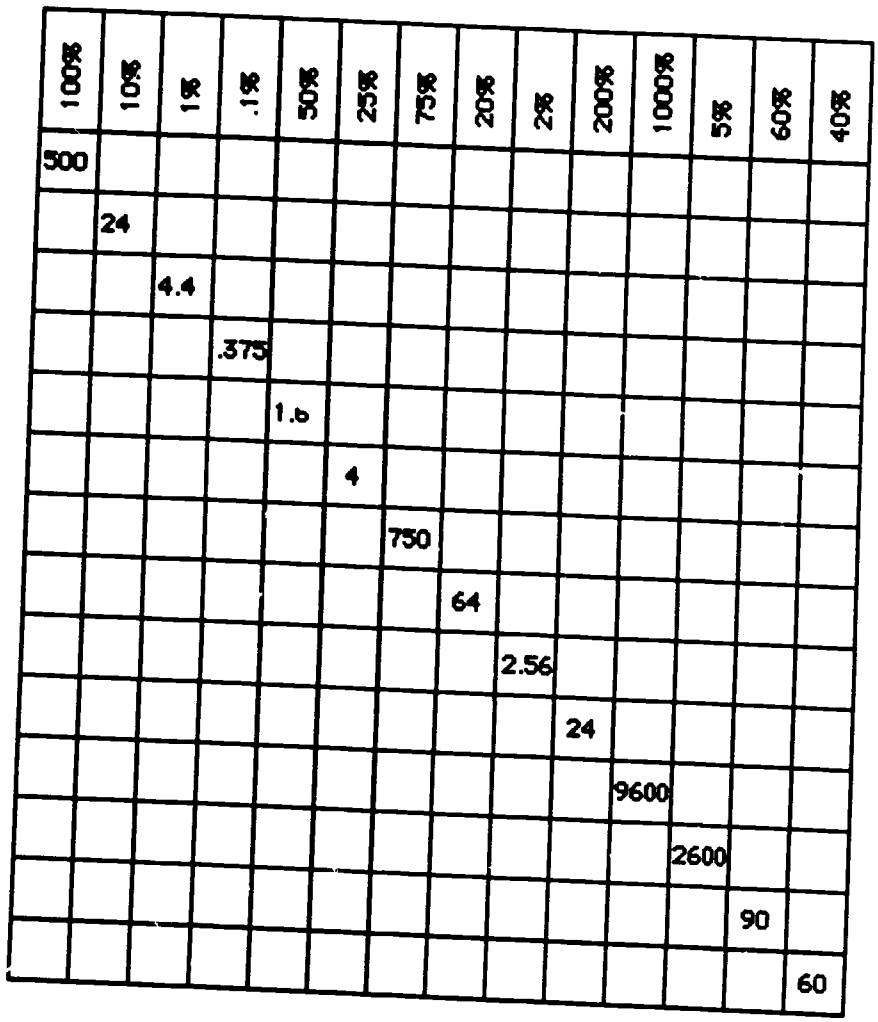
Simplified Fraction	Denom. of 100	Decimal	Percent
$\frac{1}{4}$	$\frac{25}{100}$	.25	25%
$\frac{1}{2}$	$\frac{50}{100}$	.5	50%
$\frac{1}{8}$	$\frac{12.5}{100}$	.125	12.5%
$\frac{1}{5}$	$\frac{20}{100}$	.2	20%
$\frac{3}{2}$	$\frac{150}{100}$	1.5	150%
$\frac{7}{8}$	$\frac{87.5}{100}$	.875	87.5%
$\frac{9}{10}$	$\frac{90}{100}$	.9	90%
$\frac{1}{3}$	$\frac{33.3}{100}$	.333	33.3%

Headline: IT'S ALL IN YOUR MIND

(Teaching Suggestion)



A sheet like the one pictured above is an effective way to help students realize that many percentages can be calculated mentally. Lead the class through one or two rows, helping them to see that 10%, 1%, .1%, and 1000% can be found by simply moving the decimal point, that 25% is one half of 50%, that 2% is twice 1%, that 5% is one half of 10%, etc. Students quickly realize that many of the anwers may be found by several routes. For example, 40% is 4 times 10%, twice 20%, 50%-10%, etc. Some students may notice that there are vertical relationships in the chart as well. Blank grids may be generated so that the teacher can insert top headings and/or diagonal figures depending upon the level of the student.

Headline: IT'S ALL IN YOUR MIND

(Teaching Suggestion)

100%	10%	1%	.1%	50%	25%	75%	20%	2%	200%	1000%	5%	60%	40%
500	50	5	.5	250	125	375	100	10	1000	5000	25	300	200
240	24	2.4	.24	120	60	180	48	4.8	480	2400	12	144	96
440	44	4.4	.44	220	110	330	88	8.8	880	4400	22	264	176
375	37.5	3.75	.375	187.5	93.75	281.25	75	7.5	750	3750	18.75	225	150
3.2	.32	.032	.0032	1.6	.8	2.4	.64	.064	6.4	32	.16	1.92	1.28
16	1.6	.16	.016	8	4	12	3.2	.32	32	160	.8	9.6	6.4
1000	100	10	1	500	250	750	200	20	2000	10000	50	600	400
320	32	3.2	.32	160	80	240	64	6.4	640	3200	16	192	128
128	12.8	1.28	.128	64	32	96	25.6	2.56	256	1280	6.4	76.8	51.2
12	1.2	.12	.012	6	3	9	2.4	.24	24	120	.6	7.2	4.8
960	96	9.6	.96	480	240	720	192	19.2	1920	9600	48	576	384
5200	520	52	5.2	2600	1300	3900	1040	104	10400	52000	260	3120	2080
150	15	1.5	.15	75	37.5	112.5	30	3	300	1500	7.5	90	60
150	15	1.5	.15	75	37.5	112.5	30	3	300	1500	7.5	90	60

A sheet like the one pictured above is an effective way to help students realize that many percentages can be calculated mentally. Lead the class through one or two rows, helping them to see that 10%, 1%, .1%, and 1000% can be found by simply moving the decimal point, that 25% is one half of 50%, that 2% is twice 1%, that 5% is one half of 10%, etc. Students quickly realize that many of the anwers may be found by several routes. For example, 40% is 4 times 10%, twice 20%, 50%-10%, etc. Some students may notice that there are vertical relationships in the chart as well. Blank grids may be generated so that the teacher can insert top headings and/or diagonal figures depending upon the level of the student.

INTRODUCTION TO CLASSROOM OLYMPICS

CLASSROOM OLYMPICS is a long term activity which can be used as a culminating experience for a unit on decimals. It involves students in collecting and recording data. Students use numbers and mathematics to rate and rank performances of their own and their classmates. Calculators may be used.

The **CLASSROOM OLYMPICS** activities were developed as a follow-up to **HOW DO YOU RATE**. Eight events suggested by students were selected, formalized by the teacher, and tested and revised by a small student committee. Scoring sheets were developed for each event.

One can introduce a sense of "each class as a team" and also heighten competition by incorporating inter-class competition. This works best if each class is divided up into the same number of equal-sized groups with each group representing its class in a different event. (This parallels the real Olympics where each country sends representatives to specific events). After all scheduled events have been held, it is recommended that, if varied scoring methods have been used, scores be standardized to yield a score from 0 to 10. (See suggestion offered under "Class Performance.") Once that has been done, each class can calculate its class average and the class with the highest average can be declared the winner.

Gold and silver medals can be awarded to recognize best individual performances in each event. Simple medals can be made by gluing gold or silver glitter onto $3^{1/2}$-4 inch circles of posterboard or cardboard. Glue a ribbon to the back of the "medal."

Scheduling Events

Events can be scheduled in a variety of ways depending upon teacher preference and class structure.

a) Hold one event at a time in the classroom. Class representatives for the event will take their turns while other class members record data. After all the representatives have competed, students do necessary calculations to complete the scoring for the event.

b) Hold several (2-4) events simultaneously, if space is available in the classroom. Several events can be run smoothly if the following prior steps are taken:

1. Describe the events to the class in enough detail so students have a good idea of what they will be doing. A poster or handouts describing events and rules may be helpful.

2. Permit each student to participate in one event. Prepare a sign-up sheet which includes a place for students to write their names, to number choices of events in order of preference, and to indicate willingness to serve as an event "referee." The role of the student referee is vital to the smooth running of the events. Referee duties are:
   a) to set up equipment
   b) to get other students organized and started
   c) to keep the events "moving along"
   d) to settle any disagreements over "calls" for scoring
   e) to manage and keep track of equipment

   (It is important that the referee be someone who volunteers. Experience has shown that even "questionable" volunteers can do a beautiful job organizing the other students).

Sample sign-up sheet for four events:

_____
Name of Student

Number 1 to 4 in order of preference:

_____ **Paper Airplanes**
_____ **Rubber Band Shoot**
_____ **Penny Toss**
_____ **Backboard Trashball**

☐ Put a check in the box if you are willing to be a **student "referee."**

Be sure students realize they may not get their first choice. In an effort to organize the class into equal-sized groups, you may have to redistribute group assignments.

3. Post the group assignments in the classroom for several days before the events start so students will know in which event they will be participating. Also indicate which student will be the "referee." Post the rules for each event.

4. The day before the events are to be held, give the referee for each event a copy of the rules so he/she can become familiar with them.

5. Before students begin the events, review detailed rules with them and also show them how to fill out the score sheets for their events. It is recommended that you make up some data for "Joe Smith" and take them all the way through each column.

6. Establish behavior guidelines clearly. A loss of points for unacceptable behavior may motivate appropriate but controlled displays of enthusiasm.
   Examples of inappropriate behavior:
   poor sportsmanship, poor spectatorship
   cheating, arguing, negative comments, etc.
   shouting, whistling, teasing, excessive noise, etc.
   failure to keep good records

The length of time for each event depends upon the number of people participating. All events tested have been used with groups of 10-12 students, and most took a full two class periods to brief students before the event, complete all rounds of the event, and to complete the scoring sheets. Much more prior planning would be necessary if original events are used. With some events, students had a little time left at the end of the second period to begin filling out the class performance sheet for equalizing scores from all events.

The **CLASSROOM OLYMPICS** lends itself well to use by an interdisciplinary team of teachers. That was the context in which it was originally used. The team ran eight events simultaneously. Each of the four teachers ran two events in his/her room with student referees coordinating events. With single classes, students could be divided into two teams with each student participating in several events. The element of competition between teams hightens interest.

Samples of Events and Scoring Sheets

PAPER AIRPLANES Students fold their own airplanes using "regulation" paper. Students then take turns flying their planes across the room, trying to hit a special point-zoned area on the wall.

Score per Flight

Name	Team	1	2	3	4	5	6	7	8	9	10	Total Score
Amy Green	Block 2	0	1	0	1	2	0	3	0	2	1	10

RUBBER BAND SHOOT Students shoot rubberbands (elastics) into a hole cut into the side of a small cardboard box which has been mounted on a bulletin board.

		Round 1		Round 2			
Name	Team	Tallies	First Score	Tallies	Second Score	Total Score	Shooting Percentage
Sam Jones	Block 2	IIII	4	~~IIII~~ I	6	10	$\frac{10}{20}$ =50%

PENNY TOSS Each student tosses 4 pennies into 3 water-filled cups. (The 3 cups and the student are collinear.) Points are earned according to the number of pennies per cup, with the highest possible score resulting from getting all 4 pennies into the same cup.

Name	Team	Round 1	Round 2	Round 3	Average Score
Andy White	Block 2	3	4	16	7.667

BACKBOARD TRASHBALL Students shoot baskets by bouncing balls of crumpled paper off the wall into a wastebasket while sitting a short distance in front of a wall.

Name	Team	Round 1	Round 2	Round 3	p	b	Score p + b
Sara Brown	Block 2	2	3	2	14	1	15

Class Performance (calculators recommended)

This sheet should be completed by each student after the scoring sheets are done. This represents an attempt to equalize scores for all events as much as possible. The principle is similar to that used in the scoring of the decathalon. (See "Ten Times the Fun.").

Suppose two of the events were the rubber band shoot and the paper clip throw. Students should begin by listing, by event, names of students in the class who participated in the rubber band shoot. Next, list everyone who participated in the paper clip throw. Continue in this manner until everyone in the class is accounted for. (Beside each name there should be some event designation.)

Now students should fill in the appropriate value of "h" for each event where "h" is the highest score achieved among all classes for each event. Suppose the highest score achieved by any student for the ping pong ball bounce was 6. Every student who participated in the ping pong ball bounce would get an "h" of 6. If the highest score achieved by any student in the paper clip throw was 97.2, then every student who participated in the paper clip throw would get an "h" of 97.2.

The next steps are to enter student scores in the "s" column and then to do the calculations indicated. "L" refers to points lost due to inappropriate behavior. The class average, to be used to determine the winning class, can be calculated two ways. If each event had exactly the same number of participants, you can accurately calculate the class average by adding up all of the scores and dividing by the number of students in the class. On the other hand, if a class has 6 participants in 2 events and 7 participants on the other 2, you might consider getting the average score for each event and then averaging those averages to get the class average. Although this approach has its problems, it may be "fairer" than taking a simple average across events when numbers are not weighted.

Samples for Ping Pong Ball Bounce:

Name	Event	h	s	$\frac{s}{h} = e$	e x 10	L	(e x 10) - L
Kate Mills	Ping-Pong	6	4.5	.75	7.5	0	7.5
Anne Taylor	" "	6	5.5	.917	9.17	1	8.17
Joe Smith	" "	6	6	1.0	10	0	10

s = student score
e = scoring efficiency

Headline: Keep Your Shirt On!

Keep Your Shirt On is a game to be used as a warm-up activity. The game is intended to reinforce mental arithmetic skills, to practice listening and speaking skills and to explore mathematical language as a pre-problem solving experience. Game cards relate to percent.

There are four sheets which are to be duplicated on heavy stock and cut up into 30 game cards. A template sheet is also included. It can be copied and used for teacher or student generation of new problem decks.

Keep Your Shirt On is intended as a daily or weekly experience. Class times can be kept and students can race against their own best time or compete with other classes.

If there are fewer than thirty students, multiple cards can be distributed to some individuals as all cards MUST be used to preserve the chain.

Students may need some initial instruction in computing mentally. They should be encouraged to master some basic equivalences. For example,

50% as one-half	20% as twice 10%
75% as three quarters	5% as half of 10%

Some students may feel more comfortable initially if scrap paper is used, but they should be encouraged to use paper and pencil only for recording their plan but not for doing computations.

Instructions

Distribute cards to individual students (All cards must be used)

Establish the following rules for students:

Stand and read your card aloud
Read each card twice
Read slowly and clearly
Refrain from chatting, helping, talking, etc.

Game will end when original number comes up again

Start game by having one student read his/her card

Game Cards
Keep Your Shirt On!

-Distribute one (or more) cards to each student (All cards must be used).
-Game starts with one student reading his or her card aloud.
-Establish the following rules:
Stand and read your card aloud. You will know when it is your turn.
Read each card twice.
Read slowly and clearly.
Talking, chatting, etc. is not permitted.
-Game ends when the original number comes up again.

I WEAR 

WHO WEARS 75% of two more than my number?

I WEAR 

WHO WEARS 25% of one less than my number?

I WEAR 

WHO WEARS the number of which I am 10%?

I WEAR 

WHO WEARS my number decreased by 30%?

I WEAR 

WHO WEARS 100% of my number decreased by four?

I WEAR 

WHO WEARS 33-1/3% of two more than my number?

I WEAR 

WHO WEARS 50% of my number?

I WEAR 

WHO WEARS 10% of one more than my number?

I WEAR 

WHO WEARS 300% of my number?

I WEAR 

WHO WEARS 20% of twenty times my number?

I WEAR 

WHO WEARS eight more than 75% of my number?

I WEAR 

WHO WEARS three more than 100% of my number?

I WEAR 

WHO WEARS the number of which I am 50%?

I WEAR 

WHO WEARS half of 10% of my number?

I WEAR 

WHO WEARS the number of which I am 20%?

I WEAR 

WHO WEARS six times 40% of my number?

I WEAR 

WHO WEARS the number of which I am 50%?

I WEAR 

WHO WEARS one more then 25% of my number?

I WEAR 

WHO WEARS 30% of seven more than my number?

I WEAR 

WHO WEARS three more than 200% of my number?

I WEAR 

WHO WEARS the number of which I am 25%?

I WEAR 

WHO WEARS my number decreased by 10%?

I WEAR 

WHO WEARS 60% of six more than my number?

I WEAR 

WHO WEARS 90% of six less than my number?

I WEAR 

WHO WEARS four less than 200% of my number?

I WEAR 

WHO WEARS 110% of my number?

I WEAR 

WHO WEARS 50% of five more than my number?

I WEAR 

WHO WEARS my number increased by 30%?

I WEAR 

WHO WEARS 70% of one more than my number?

I WEAR 

WHO WEARS 150% of my number?

259

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

260

KEEP YOUR SHIRT ON - Answers

Sequence Order

Shirt Number	Answer
42	33
33	8
8	80
80	56
56	52
52	18
18	9
9	1
1	3
3	12
12	17
17	20
20	40
40	2
2	10
10	24
24	48
48	13
13	6
6	15
15	60
60	54
54	36
36	27
27	50
50	55
55	30
30	39
39	28
28	42

Start with any card and follow sequence from that point.

Ascending Order

Shirt Number	Answer
1	3
2	10
3	12
6	15
8	80
9	1
10	24
12	17
13	6
15	60
17	20
18	9
20	40
24	48
27	50
28	42
30	39
33	8
36	27
39	28
40	2
42	33
48	13
50	55
52	18
54	36
55	30
56	52
60	54
80	56

Headline: At The Half

AT THE HALF is a game that can be used in several ways. The ninety-six **AT THE HALF** game cards are separated into 6 categories of sixteen cards each. Each trivia fact requires a student computation for completion. Paper and pencil or calculators may be used at the discretion of the teacher. Point values reflect the difficulty of the computational exercise. **AT THE HALF** cards can be used in a number of ways ranging from whole class to small group or individual activities. Suggestions follow, but teachers (and students) are encouraged to be inventive about alternative game activities.

Card Categories

Marathon	Hockey
Baseball	Basketball
Football	Miscellaneous

Concepts

Decimals
Percent
Whole Numbers
Fractions

References

"And They All Say, 'This Is It?' " Sports Illustrated, by Leigh Montville
Book of Lists #2
Book of Lists #3
Boston Bruins 1985-86 Yearbook
Boston Celtics 1984-85 Official Yearbook
1986 Boston Marathon Press Kit (Ninetieth Annual)
Boston Trivia, by Morgan White, Jr. & Bernard Corbett
Guinness Book of World Records--1986

Instructions for Whole Class (Teams of 4-5 students)

1. Group students into teams of 4-5 members who can sit in close proximity. Arrange cards in six piles (face down) by category. When each team has selected a card, students work within a time limit to arrive at a team answer. At the end of the time limit, the teacher checks the team's answer. If correct, one team member writes the point value on the score sheet drawn on the blackboard. There is no discussion of answers. When all answers have been checked, cards are collected and teams again choose cards. Play continues until a time limit is up or until one team reaches a specified point value (e.g. 50 pts., 60 pts. etc.).

2. Group class into teams of 4-5 students who can sit in close proximity. Play "Jeopardy". One team chooses a sport and point value. Teacher reads the question to the whole class or puts it on an overhead projector. Each team works out the problem, decides on one answer, and raises hands calling out team name (selected by students). Teacher calls on first team with an answer. If correct, points are accumulated and that team chooses the next question. If incorrect, points are deducted and another team gives its answer. There should be a predetermined time limit for each question. Play continues until a time limit is up or one team reaches a certain point value (e.g. 100 points).

team chooses the next question. If incorrect, points are deducted and another team gives its answer. There should be a predetermined time limit for each question. Play continues until a time limit is up or one team reaches a certain point value (e.g. 100 points).

Other Ideas for Use

-Develop a student answer sheet with workspace for checking calculations. This may be used in different variations of the game.

-Use as a bulletin board activity: place 2 or 3 cards on board each day. Check answers at week's end and give points for correct answers.

-Use as Math Corner activity for 2 to 4 players.

-Make transparencies to be used in many variations of the game.

-Make up your own rules for use to suit the class and teacher style.

-Reward winners. Winning team may be given a "prize" or reward.

-Double point values if answers are arrived at mentally.

-Use it as a quiz: use an answer sheet and choose 10 questions whose points add up to 100. Add up points of correct answers for score.

-Have students develop cards for next year's class (same sports, new sports, school or other local data).

1 Cy Young played **10% of 5110** games during his career. How many games did he play?	**2** The .975 Boston Red Sox won **59 3/8%** of **160** games played. How many games did they win?
3 On May 5th of the year **.04 x 47,600**, Cy Young pitched a perfect game (9 innings) against Philadelphia. The score was 3-0. What was the year?	**4** Tony Armas was Home Run Champion in 1984 when he hit **3 more than 500% of 8** home runs. How many home runs did he hit?
5 Jim Rice was Home Run Champion three times. In 1977 he hit 39, in 1978 he hit 46, and in 1983 he hit n. How many home runs did he hit in 1983 if **2n + (n + 7) = 124**?	**6** Wade Boggs was American League Batting Champion in 1985 with an average of **.4 x .92**. What was his batting average that year?
7 Carl Yastrzemski was American League Batting Champion in 1968 with an average of **.2107 ÷ .7**. What was his batting average that year? (This was the lowest average ever needed to win the batting title.)	**8** While pitching for the Red Sox, Hubert B. (Dutch) Lenard had the lowest earned run average during the 1914 season. Find his average by finding the difference between **2.003** and **.993**.

Percent

15 pts.

Percent

5 pts.

Percent

15 pts.

Decimals

5 pts.

Decimals

5 pts.

Guess What?

10 pts.

Decimals

10 pts.

Decimals

10 pts.

9

Through 1984 the Boston Red Sox had played in 8 World Series. They won **62 1/2% of those 8** series. How many World Series had they won?

10

On June 8, 1950, the Boston Red Sox beat the St. Louis Browns in the most lopsided win since 1900. The score was **2/3 x 24 + 1/2 x 22 + 2 to 4**. What was the Red Sox score?

11

The new Fenway Park opened April 17, $10^3 + 2 \times 467$. In what year did the "modern" Fenway Park open?

12

While playing for Boston, Ted Williams was a six-time American League Batting Champion:

Year	Percentage
1958	.328
1957	.388
1948	.369
1947	.343
1949	.356
1941	.401

Put these decimals in decreasing order.

13

While playing for the Red Sox, Ted Williams was Home Run Champion 4 times:

Year	Home Runs
1949	43
1947	32
1942	36
1941	37

Find his average number of home runs for these years.

14

In the year **3/5 x 3155**, the distance from home plate to where the pitcher must stand was changed from 50 feet to the current 60 feet 6 inches. In what year was this change made?

15

The last time the Boston Red Sox were World Champions was in the year **50% of 3836**. What year was this?

16

Johnny Pesky holds the Major League hit record of **950 + 4 3/4** or more in each of his first three seasons. At least how many hits did he have in each of his first three seasons?

15 pts.

10 pts.

5 pts.

10 pts.

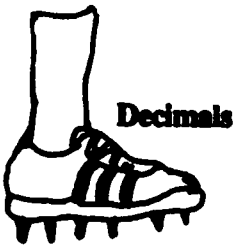
5 pts.

5 pts.

10 pts.

5 pts.

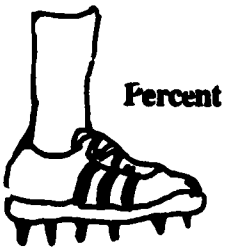
1 Between 1975 and 1984 the Patriots played **3 times 23.8%** of their games on artificial turf. What percentage of their games were played on grass?	2 Prior to 1985, the Patriots' longest winning streak was .2 of 35 games. How many games were in their longest winning streak?
3 Prior to 1985, the Patriots' record for season opening games at Sullivan Stadium was 4 wins and 8 losses. What percent of these games did they win?	4 Prior to 1985, the Patriots' record in domed stadiums was 7 wins and 5 losses. To the nearest whole percent, what percent of these games did they win?
5 In the first 25 years of their existence, the Patriots made 155 trades. This averages out to how many trades per year?	6 The largest crowd ever to see the Patriots play was **93,001 more than 25% of 1000** at a preseason game at the University of Tennessee Stadium. How many people were there?
7 Prior to 1985 Stanley Morgan had **.25 of 92** games where he caught passes for more than 100 yards. How many such games did he have?	8 The worst season finish for the Patriots was in 1981 when they lost their last **3.6 + .4** games. How long was this losing streak?



5 pts.

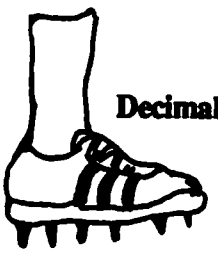
15 pts.

10 pts.



10 pts.

10 pts.



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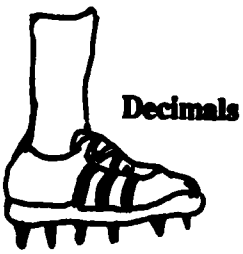

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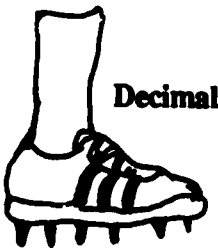


5 pts.

9

In Boston television ratings, 1 point means 1% of 1.9 million homes. In 1984, when the Patriots played the Dallas Cowboys, the rating was 20.5. How many homes were tuned into this game?

10

Between 1960 and 1984, the Patriots drafted 474 players. More came from Boston College than from any other school. If n came from BC and $3(n-2) = 39$, how many of the draftees were from Boston College?

11

Tony Franklin, the Patriots' barefoot kicker, made 24 of 30 field goals in 1985. What percent of the time was he successful?

12

Prior to 1985 the Patriots had drafted 474 players from 10% of 1840 colleges. How many colleges supplied the Patriots with players?

13

0.01 of 7,381,800 people made up the sellout crowd at the 1986 Super Bowl in New Orleans. How many people were there?

14

After getting to the Super Bowl, the Patriots raised the price of a sideline bench seat from $16 to $21. This was an increase of _____ %.

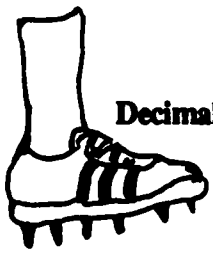
15

In the Super Bowl, the Patriots scored less than 1/4 as many points as the Bears. If the Patriots scored 10 points, the Bears' score had to be more than _____ points.

16

In 1985, the Patriots' leading scorer was their kicker, Tony Franklin, who made 40 of 41 points after touchdowns for 1 point each and 24 of 30 field goals for 3 points each. How many points did he score in 1985?

10 pts.

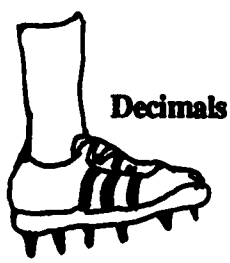


15 pts.

5 pts.

10 pts.

10 pts.



5 pts.

10 pts.

5 pts.

1 In 1929-30, Cooney Weiland was the first Bruin to win a scoring title. His statistics were **25% of 172** goals, **75% of 40** assists, and **73% of 100** points. What were his statistics?	2 The Bruins' legendary Eddie Shore played **3 less than 16 2/3% of 150** seasons in Boston. How many seasons did Eddie Shore play for the Bruins?
3 The area of the rink in Boston Garden is 15,853 square feet. The width is 83 feet. What is the length assuming a nearly rectangular shape?	4 Seating capacity for a Bruins game at Boston Garden is **20% of 72,410**. How many people make up a sellout crowd for the Bruins?
5 During the Bruins' season, a base layer of ice is kept on the floor of the Boston Garden rink. It is $.5^2$ in. thick. How thick is this?	6 John Bucyk played 21 seasons for the Boston Bruins. During this time he scored 545 goals. To the nearest whole number, what was the average number of goals he scored per season?
7 Between 1924 and 1985, the Bruins won 1837 games, lost 1444 games, and tied 591 games. Altogether they played _____ games.	8 Ray Borque, Tom Fergus, and Ken Linseman registered points against all opponents during the 1984-85 season. Find the number of opponents, n, if **.007n = .14**.

15 pts.

15 pts.

5 pts.

5 pts.

10 pts.

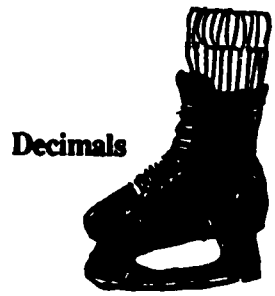
5 pts.

10 pts.

5 pts.

200A

9 The 1929-30 Bruins hold the team record for the longest winning streak with **1/2 x 20 + 4** consecutive wins. How many games is this?	**10** The 1961-62 Boston Bruins hold the team record for the longest losing streak with **(62 + 6.2) + 10** consecutive losses. How many games is this?
11 The Boston Bruins hold the league record for the most penalties in one game, when they had **7 x 15% of ..** penalties on February 26, 1981, against the Minnesota North Stars in a game at Boston Garden. How many penalties did they have?	**12** Bobby Orr was the league leading scorer in 1974-75 with 135 points. If he scored n goals and **2n - 3** assists, how many goals and assists did he score? **n + (2n - 3) = 135**
13 The Bruins' Bobby Orr set the league record for the most assists in one season by a defenseman, when he had **75% of 136** assists during the 1970-71 season. How many assists did he have?	**14** The Boston Bruins' Phil Esposito holds the league record for most shots on goal in one season with **2 x 5^2 x 11** shots on goal during the 1970-71 season. How many shots on goal did he make?
15 The Bruins' Ray Borque accumulated **35,000 x .01** regular season penalty minutes between 1979 and 1985. How many minutes of penalties is this?	**16** While playing for the Boston Bruins, Derek Sanderson wore number **2/3 x 30 - 20 + 5**. What was his number?



10 pts.

10 pts.

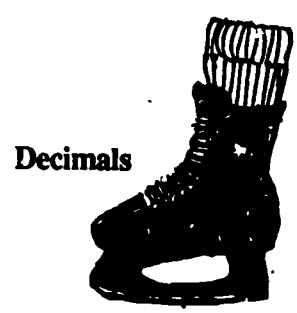
15 pts.

10 pts.

5 pts.

5 pts.

10 pts.



5 pts.

1 The Boston Celtics hold the record for consecutive World Championships at $36 + 4\ 1/2$. What is this record?	2 During the 1985-86 regular season all 38 Celtics home games were sellouts. This means that $(2 \times 3 \times 4 \times 5 \times 6 \times 7) + (2^2 \times 3^4 \times 5^2) + (2 \times 5^3 \times 7)$ people attended each home game. How many people is this?
3 The parquet floor of the Boston Garden is composed of $.6 \times 440$ pieces which are assembled and disassembled approximately 120 times per season. How many pieces are there?	4 The numbers of the Boston Celtics starters for 1985-86 were Robert Parish (00), Dennis Johnson (3), Larry Bird (33), Kevin McHale (32), and Danny Ainge (44). Find the average of these numbers to the nearest tenth.
5 En route to their 16th World Championship, the 1985-86 Celtics lost only 3 of 18 playoff games. What percent of their playoff games did they win?	6 Three Boston Celtics played on the Eastern Conference All-Star Team in 1986: Larry Bird (33), Kevin McHale (32), and Robert Parish (00). Find the product of their numbers.
7 Larry Bird began playing for the Boston Celtics in the year n. What year was this if $5n + 105 = 10{,}000$?	8 On February 27, 1959, while playing for the Celtics, Bob Cousy set the record for the most assists made in a half with 250% of 7.6. How many assists was this?

Whole Numbers

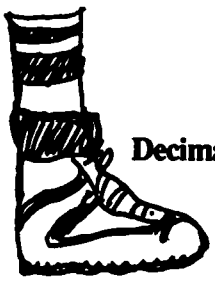
10 pts.

Fractions

5 pts.

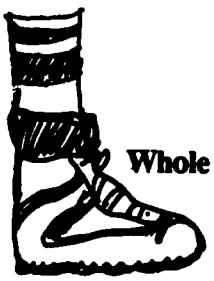
Guess What?

10 pts.



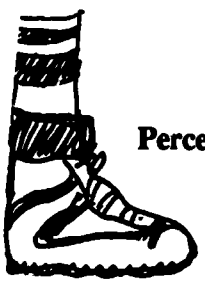
Decimals

5 pts.



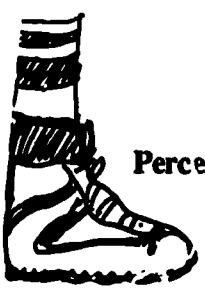
Whole Numbers

5 pts.



Percent

15 pts.



Percent

10 pts.

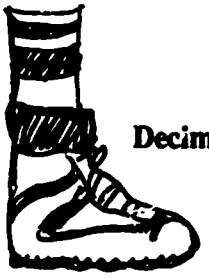
Guess What?

10 pts.

9 The Celtics' Bill Russell holds the career record for rebounds with $2^3 \times 3^3 \times 19$ in 13 years. How many rebounds is this?	**10** In the Boston Garden there are approximately **1986 + 1.986** obstructed view seats, depending on the configuration of the seats. How many obstructed view seats are there?
11 Red Auerbach coached the Boston Celtics for **80% of his 20** seasons in the NBA. For how many seasons did Red coach the Celtics?	**12** On January 4, 1985, the number **13.06 + 6.53** was hoisted to the rafters of Boston Garden in honor of Red Auerbach. What number was retired?
13 On January 10, **1081.68 + 885.32**, Red Auerbach became the only coach ever ejected from an NBA All-Star Game. What year was this?	**14** During the 1957 NBA All-Star Game at Boston Garden, Bill Sharman made an n foot shot while attempting to pass to Bob Cousy. How long was this shot if **10 is 12 1/2% of n?**
15 In what year was the Boston Garden built, if it was built in **1/2% of 385,600?**	**16** The most field goals attempted in one season was **1/2(3000 + 3/4) - 18** by Celtic John Havilcek during the 1970-71 season. How many field goals did he attempt?

5 pts.

5 pts.



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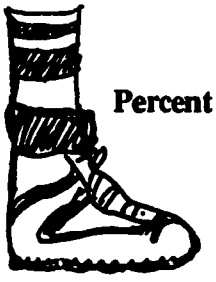

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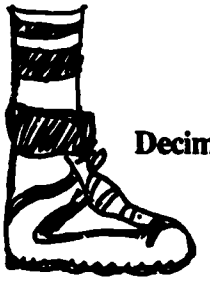

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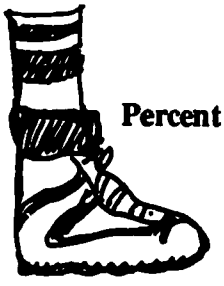
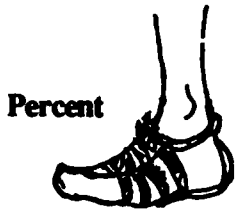
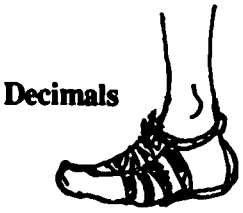


15 pts.

1 In 1985 there were 5595 official entries in the Boston Marathon. If each paid $10.00 to enter, how much was collected?	2 In 1986 the Boston Marathon prize for coming in 10th was $2500, for 9th, $4000. The 10th place prize money is what percent of the 9th prize money?
3 The widest margin of victory for women in the Boston Marathon was 9 minutes 59 seconds. If the second place runner had a time of 3 hours 20 minutes 35 seconds, what was the winning time?	4 The 5th place prize money in the Boston Marathon is 66 2/3% of the 3rd place prize money. If the fifth place prize is $10,000, how much does the 3rd place finisher receive?
5 First place prize money in the Boston Marathon is $2500 for wheelchair and $30,000 for runners. Express the ratio of wheelchair prize money to runner prize money as a reduced fraction.	6 In 1968 only 1013 people entered the Boston Marathon. In 1985 there were 5595 entries. This is an increase of approximately: A) 18% B) 550% C) 450% D) 22% (choose one)
7 The closest finish ever in the Boston Marathon was in 1982 when only n seconds separated the first two runners. If n = .0002 x 10,000, find n.	8 A very good time in the Boston Marathon is 2 1/5 hours. The course is about 26 1/5 miles. This represents a speed of about _____ (nearest 1/10 m.p.h.) Note: $R = \frac{D}{T}$



10 pts.



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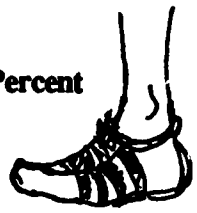

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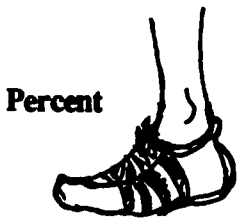
10 pts.



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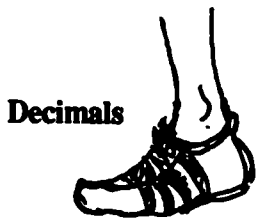
5 pts.



10 pts.

10 pts.

9 In 1985, **24.05%** of the runners in the Boston Marathon were in the 40-44 age bracket. If 5122 started, how many runners were in this age bracket?	10 In the 1985 Boston Marathon, in the 55-59 age group, **(20% of 400) + (200% of 65)** finished. What fractional part (reduced) of the group finished?
11 The Boston Marathon has been run every year since 1897 except one. The year in which it was not run was $1 \times 10^3 + 9 \times 10^2 + 1 \times 10^1 + 8 \times 10^0$ or_____. Why might it not have been run in this year?	12 The Boston Marathon passes through n cities or towns between Hopkinton and Boston. Find n if $4n - 3 = 21$.
13 The "Living Legend" of the Boston Marathon is John A. Kelley. He has run in **11/18 of the 90** marathons. How many times has he run? (He won twice and finished all but 3 times.)	14 Bill Rogers has won the Boston Marathon in 2 hours 9 minutes 55 seconds (1975); the New York Marathon in 2 hours, 11 minutes, 42 seconds (1979); and the Houston Marathon in 2 hours 12 minutes 20 seconds. What was his average winning time in these three victories?
15 Joan Benoit ran the Boston Marathon in 2 hours 22 minutes 43 seconds in 1983. The 43 seconds was what percent of her total time? Give to the nearest .1 percent.	16 The Framingham Railroad Station is the **2.5% x 270** mile mark in the Boston Marathon. How far have the runners gone when they pass this checkpoint?

Percent

10 pts.

Percent

10 pts.

Guess What?

10 pts.

Guess What?

5 pts.

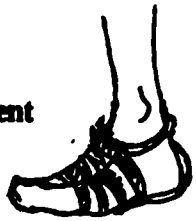
Guess What?

15 pts.

Fractions

10 pts.

Percent



10 pts.

Percent

15 pts.

205 A

1 A sellout crowd at Boston Garden for Hockey is 14,482. A sellout at Fenway Park for a Red Sox game is 33,583. To the nearest .1%, a sellout crowd at Fenway Park is what percent of a sellout crowd at Boston Garden?	**2** The women's distance record for archery is a shot of 1039 yards. Express this distance to the nearest .1 meter given 1 yard is approximately equal to .91 meter.
3 In 1984 the United States had 159,089 bowling lanes in 8351 establishments. To the nearest hundredth, what is the average number of lanes in each bowling establishment?	**4** The longest boxing match in history lasted .2 of 550 rounds. It occurred in New Orleans in 1983, and lasted over 7 hours. How many rounds did it last?
5 If two sellout crowds of 33,583 from Fenway Park went to Sullivan Stadium which seats 61,000, how many people would be left standing?	**6** The world record for distance covered by a bicycle in 24 hours is 2 x 257.9 miles. This was done by a man from Finland in 1974. How many miles did he travel in one day?
7 In a 77 day period one man caught 3001 bass using a rod and reel. He threw all but 24 back. To the nearest whole percent, what percent of the bass he caught did he throw back?	**8** The largest swordfish ever caught weighed 1.182 x [illegible] lbs. Express this weight as a decimal numeral.

Decimals

10 pts.

Percent

15 pts.

Decimals

5 pts.

Decimals

10 pts.

Decimals

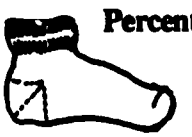
10 pts.

Whole Numbers

10 pts.

Guess What?

5 pts.



Percent

10 pts.

206A

9_

Checkers is an ancient sport which was played in Egypt in the second millennium B.C. The earliest book on the game was written in the year A.D. whose prime factorization is **17 x 13 x 7**. What year was this?

10

The longest golf course in the world is the International Golf Club in Bolton, Massachusetts. It is 299,700 inches long. How many yards long is it?

11

Boston had a pro tennis team called the Lobsters. Once they won a game 60-30. The winning score was what percentage of the losing score?

12

The most successful Jockey ever is Willie Shoemaker. His birthweight of 2 1/2 lbs. is what percent of his adult weight of 94 lbs.? (to the nearest tenth)

13

In 1985 a women's 500 meter speed skating record was set by Eiko Shishii of Japan with a speed of **1.91 + .327 + 44 + 2.653** seconds. What was her time?

14

Twin brothers, Phil and Steve Mahre of the United States won the gold and silver slalom skiing medals at the 1984 Olympics. Their times were less than 1 second apart. Phil's winning time was 20.19 seconds short of 2 minutes What was his time?

15

The longest chair lift in the world is in New South Wales, Australia. It is 3.5 miles long and the ride takes from .75 to 1.25 hours depending on the weather. The speed of the chair lift in miles per hour ranges from _____ to _____ depending on the weather.

16

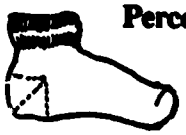
Swimming races are timed electronically to the nearest .01 second and yet there was a tie for a gold medal in the 1984 Olympics between two United States women in the 100 meter freestyle. Their equal times totalled 111.84 seconds when added together. What was the winning time?

Whole Numbers

5 pts.

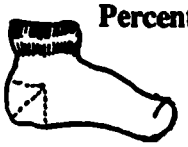
Whole Numbers

5 pts.



Percent

15 pts.

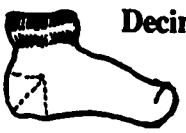


Percent

5 pts.

Decimals

10 pts.



Decimals

10 pts.

Decimals

10 pts.

Decimals

15 pts.

207 A

Game Answers

BASEBALL

1	511	9	5
2	95	10	29
3	1904	11	1934
4	43	12	.401, .388, .369, .356, .343, .328
5	39	13	37
6	.368	14	1893
7	.301	15	1918
8	1.01	16	200

FOOTBALL

1	28.6 %	9	389,500
2	7	10	15
3	33-1/3%	11	80%
4	58 %	12	184
5	6.2	13	73,818
6	93,251	14	31.25%
7	23	15	40
8	9	16	112

HOCKEY

1	43 goals 73 pts. 30 assists	9	14
2	22	10	20
3	191 feet	11	42
4	14,482	12	46 goals 89 assists
5	25" or 1/4"	13	102
6	26	14	550
7	3872	15	350 min.
8	20	16	16

BASKETBALL

1	8	9	4104
2	14,890	10	1000
3	264	11	16
4	22.4	12	2
5	83-1/3%	13	1967
6	0	14	80 ft.
7	1979	15	1928
8	19	16	1982

MARATHON

1	$55,950	9	1232
2	62.5 %	10	8/13
3	3 hrs. 10 min. 36 sec.	11	1918 (WW1)
4	$15,000	12	6
5	1/12	13	55
6	C	14	2 hrs. 11 mins. 19 sec.
7	2 seconds	15	.5%
8	11.9 mph	16	6.75 mi.

MISCELLANEOUS

1	231.9%	9	1547
2	945.5 meters	10	8325 yds.
3	19.05	11	200%
4	110	12	2.7%
5	6166	13	48.89 sec.
6	515.8 miles	14	1 min. 39.81 sec
7	99%	15	2.8 to 4.7 mph
8	1182 lbs.	16	55.92 sec.

SPORTS RESOURCES

THE FOLLOWING *PRINTED* MATERIALS ARE HELPFUL RESOURCES FOR TEACHERS:

The Arithmetic Teacher, National Council of Teachers of Mathematics
AAPHERD Youth Fitness Test Manual, Revised 1976 Edition, AAPHERD Publications
The 1986 Almanac, Houghton Mifflin Company
Book of Lists #2, William Morrow and Company, Inc.
Book of List #3, William Morrow and Company, Inc.
Boston Bruins 1985 - 1986 Yearbook, Boston Professional Hockey Association, Inc.
Boston Celtics 1984 - 1985 Official Yearbook, Boston Pheonix, Inc.
Boston Globe
The Boston Marathon: Racer's Recordbook 1985 Official Computer Results
The Boston Marathon: The Boston Marathon 1986 Official Program, Boston Phoenix, Inc.
The 1986 Boston Marathon Press Kit, Boston Athletic Association
Boston Red Sox Press Guide
Boston Trivia, Morgan White, Jr. and Bernard Corbett, Addison C. Getchell & Son, Inc.
Golf Magazine, Times Mirror Magazines, Inc.
Guinness Book of Sport Record, Sterling Publishing Company, Inc.
Guinness Book of World Records, 1986, Sterling Publishing Company, Inc.
New England Patriots 1985 Fact Book
Sports Illustrated, Time, Inc.
Sportscape, The New England Sports Journal, Sportscape, Inc.
Super Bowl Supplement, 1986, The Patriot Ledger

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OTHER RESOURCES

Boston Athletic Association
Boston Red Sox Organization
John Hancock Corporation
New Boston Garden Corporation, (Steve Nazro)
New England Patriot's Club, (Jim Greenridge)
Quincy Patriot Ledger, (Ron Hobson)

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***COMPUTER SOFTWARE* PERTAINING TO SPORTS:**

Advanced Ideas
"Tic Tac Show and Sports Facts"
Avant-Garde
"Professional Golf Challenger"
Electronic Arts
"Dr. J and Larry Bird Go One on One"
Focus Media
"The Time Tunnel: Sports Edition"
MECC (Minnesota Educational Computer Consortium)
"Sports Stats"
"Basketball"
"Wrestling"
Microsoft Corporation
"Olympic Decathalon"
Professional Software
"Super Sports" (sports trivia)
"World Series Baseball"
Scholastic
"Soccer Math"
Strategic Simulations
"Computer Baseball" (game strategy)
"Professional Golf Tour"
SVE (Society for Visual Education, Inc.)
"Math Sports Package"

COMPUTER SOFTWARE PERTAINING TO DECIMALS AND PERCENTS:

D.C. Heath
"Surveys"

Houghton-Mifflin
"Mathematics Activities Courseware"
Levels 6,7,8

Scholastic
"Decimals"

Strictly Software
"Number Bowling: Decimals and Fractions"
(math action game series)

SVE (Society for Visual Education, Inc.)
"Decimals: Addition and Subtraction"
"Decimals: Multiplication and Division"
"Decimals, Percents, Rations, and Proportions"
"Fractions, Decimals, and Percent"

Game Cards
Keep Your Shirt On!

-Distribute one (or more) cards to each student (All cards must be used).
-Game starts with one student reading his or her card aloud.
-Establish the following rules:
Stand and read your card aloud. You will know when it is your turn.
Read each card twice.
Read slowly and clearly.
Talking, chatting, etc. is not permitted.
-Game ends when the original number comes up again.

I WEAR 

WHO WEARS 75% of two more than my number?

I WEAR 

WHO WEARS 25% of one less than my number?

I WEAR 

WHO WEARS the number of which I am 10%?

I WEAR 

WHO WEARS my number decreased by 30%?

I WEAR 

WHO WEARS 100% of my number decreased by four?

I WEAR 

WHO WEARS 33-1/3% of two more than my number?

I WEAR 

WHO WEARS 50% of my number?

I WEAR 

WHO WEARS 10% of one more than my number?

I WEAR 

WHO WEARS 300% of my number?

I WEAR 

WHO WEARS 20% of twenty times my number?

I WEAR 

WHO WEARS eight more than 75% of my number?

I WEAR 

WHO WEARS three more than 100% of my number?

I WEAR 

WHO WEARS the number of which I am 50%?

I WEAR 

WHO WEARS half of 10% of my number?

I WEAR 

WHO WEARS the number of which I am 20%?

I WEAR 

WHO WEARS six times 40% of my number?

I WEAR 

WHO WEARS the number of which I am 50%?

I WEAR 

WHO WEARS one more then 25% of my number?

I WEAR 

WHO WEARS 30% of seven more than my number?

I WEAR 

WHO WEARS three more than 200% of my number?

I WEAR 

WHO WEARS the number of which I am 25%?

I WEAR 

WHO WEARS my number decreased by 10%?

I WEAR 

WHO WEARS 60% of six more than my number?

I WEAR 

WHO WEARS 90% of six less than my number?

I WEAR 

WHO WEARS four less than 200% of my number?

I WEAR 

WHO WEARS 110% of my number?

I WEAR 

WHO WEARS 50% of five more than my number?

I WEAR 

WHO WEARS my number increased by 30%?

I WEAR 

WHO WEARS 70% of one more than my number?

I WEAR 

WHO WEARS 150% of my number?

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

I WEAR 

WHO WEARS

1 Cy Young played **10% of 5110** games during his career. How many games did he play?	**2** The 1975 Boston Red Sox won **59 3/8%** of **160** games played. How many games did they win?
3 On May 5th of the year **.04 x 47,600**, Cy Young pitched a perfect game (9 innings) against Philadelphia. The score was 3-0. What was the year?	**4** Tony Armas was Home Run Champion in 1984 when he hit **3 more than 500% of 8** home runs. How many home runs did he hit?
5 Jim Rice was Home Run Champion three times. In 1977 he hit 39, in 1978 he hit 46, and in 1983 he hit n. How many home runs did he hit in 1983 if **2n + (n + 7) = 124**?	**6** Wade Boggs was American League Batting Champion in 1985 with an average of **.4 x .92**. What was his batting average that year?
7 Carl Yastrzemski was American League Batting Champion in 1968 with an average of **.2107 ÷ .7**. What was his batting average that year? (This was the lowest average ever needed to win the batting title.)	**8** While pitching for the Red Sox, Hubert B. (Dutch) Lenard had the lowest earned run average during the 1914 season. Find his average by finding the difference between **2.003** and **.993**.

15 pts.

5 pts.

15 pts.

5 pts.

5 pts.

10 pts.

10 pts.

10 pts.

9

Through 1984 the Boston Red Sox had played in 8 World Series. They won **62 1/2%** of those 8 series. How many World Series had they won?

10

On June 8, 1950, the Boston Red Sox beat the St. Louis Browns in the most lopsided win since 1900. The score was **2/3 x 24 + 1/2 x 22 + 2** to 4. What was the Red Sox score?

11

The new Fenway Park opened April 17, $10^3 + 2 \times 467$. In what year did the "modern" Fenway Park open?

12

While playing for Boston, Ted Williams was a six-time American League Batting Champion:

Year	Percentage
1958	.328
1957	.388
1948	.369
1947	.343
1949	.356
1941	.401

Put these decimals in decreasing order.

13

While playing for the Red Sox, Ted Williams was Home Run Champion 4 times:

Year	Home Runs
1949	43
1947	32
1942	36
1941	37

Find his average number of home runs for these years.

14

In the year **3/5 x 3155**, the distance from home plate to where the pitcher must stand was changed from 50 feet to the current 60 feet 6 inches. In what year was this change made?

15

The last time the Boston Red Sox were World Champions was in the year **50% of 3836**. What year was this?

16

Johnny Pesky holds the Major League hit record of **950 + 4 3/4** or more in each of his first three seasons. At least how many hits did he have in each of his first three seasons?

15 pts.

10 pts.

5 pts.

10 pts.

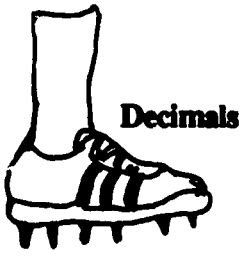
5 pts.

5 pts.

10 pts.

5 pts.

1 Between 1975 and 1984 the Patriots played 3 times 23.8% of their games on artificial turf. What percentage of their games were played on grass?	2 Prior to 1985, the Patriots' longest winning streak was .2 of 35 games. How many games were in their longest winning streak?
3 Prior to 1985, the Patriots' record for season opening games at Sullivan Stadium was 4 wins and 8 losses. What percent of these games did they win?	4 Prior to 1985, the Patriots' record in domed stadiums was 7 wins and 5 losses. To the nearest whole percent, what percent of these games did they win?
5 In the first 25 years of their existence, the Patriots made 155 trades. This averages out to how many trades per year?	6 The largest crowd ever to see the Patriots play was 93,001 more than 25% of 1000 at a preseason game at the University of Tennessee Stadium. How many people were there?
7 Prior to 1985 Stanley Morgan had .25 of 92 games where he caught passes for more than 100 yards. How many such games did he have?	8 The worst season finish for the Patriots was in 1981 when they lost their last 3.6 + .4 games. How long was this losing streak?

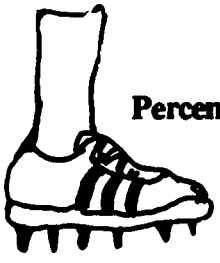


5 pts.

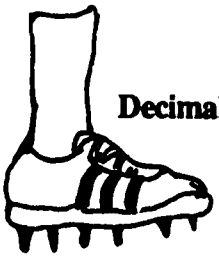
15 pts.

10 pts.

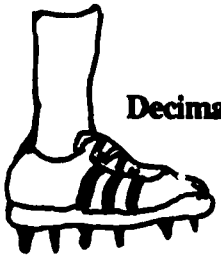
10 pts.



10 pts.



10 pts.



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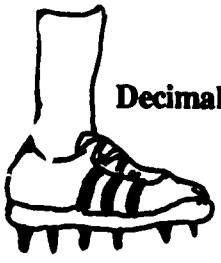
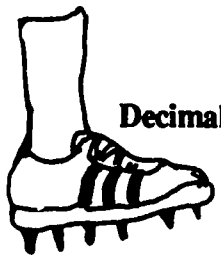


5 pts.

B A

9 In Boston television ratings, 1 point means 1% of 1.9 million homes. In 1984, when the Patriots played the Dallas Cowboys, the rating was 20.5. How many homes were tuned into this game?	**10** Between 1960 and 1984, the Patriots drafted 474 players. More came from Boston College than from any other school. If n came from BC and 3(n-2) = 39, how many of the draftees were from Boston College?
11 Tony Franklin, the Patriots barefoot kicker, made 24 of 30 field goals in 1985. What percent of the time was he successful?	**12** Prior to 1985 the Patriots had drafted 474 players from 10% of 1840 colleges. How many colleges supplied the Patriots with players?
13 0.01 of 7,381,800 people made up the sellout crowd at the 1986 Super Bowl in New Orleans. How many people were there?	**14** After getting to the Super Bowl, the Patriots raised the price of a sideline bench seat from $16 to $21. This was an increase of _____ %.
15 In the Super Bowl, the Patriots scored less than 1/4 as many points as the Bears. If the Patriots scored 10 points, the Bears' score had to be more than _____ points.	**16** In 1985, the Patriots' leading scorer was their kicker, Tony Franklin, who made 40 of 41 points after touchdowns for 1 point each and 24 of 30 field goals for 3 points each. How many points did he score in 1985?

10 pts.

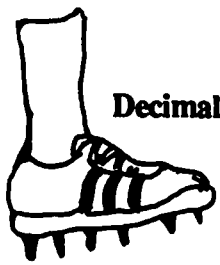


15 pts.

5 pts.

10 pts.

10 pts.



5 pts.

10 pts.

5 pts.

1 In 1929-30, Cooney Weiland was the first Bruin to win a scoring title. His statistics were **25%** of 172 goals, **75%** of 40 assists, and **73%** of 100 points. What were his statistics?	2 The Bruins' legendary Eddie Shore played **3 less than 16 2/3%** of [illegible] seasons in Boston. How many seasons did Eddie Shore play for the Bruins?
3 The area of the rink in Boston Garden is 15,853 square feet. The width is 83 feet. What is the length assuming a nearly rectangular shape?	4 Seating capacity for a Bruins game at Boston Garden is **20%** of **72,410**. How many people make up a sellout crowd for the Bruins?
5 During the Bruins' season, a base layer of ice is kept on the floor of the Boston Garden rink. It is $.5^2$ in. thick. How thick is this?	6 John Bucyk played 21 seasons for the Boston Bruins. During this time he scored 545 goals. To the nearest whole number, what was the average number of goals he scored per season?
7 Between 1924 and 1985, the Bruins won 1837 games, lost 1[illegible]4 games, and tied 591 games. Altogether they played _____ games.	8 Ray Borque, Tom Fergus, and Ken Linseman registered points against all opponents during the 1984-85 season. Find the number of opponents, n, if **.007n = .14.**

15 pts.

15 pts.

5 pts.

5 pts.

10 pts.

5 pts.

10 pts.

5 pts.

9 The 1929-30 Bruins hold the team record for the longest winning streak with **1/2 x 20 + 4** consecutive wins. How many games is this?	**10** The 1961-62 Boston Bruins hold the team record for the longest losing streak with **(62 + 6.2) + 10** consecutive losses. How many games is this?
11 The Boston Bruins hold the league record for the most penalties in one game, when they had **7 x 15% of 40** penalties on February 26, 1981, against the Minnesota North Stars in a game at Boston Garden. How many penalties did they have?	**12** Bobby Orr was the league leading scorer in 1974-75 with 135 points. If he scored n goals and **2n - 3** assists, how many goals and assists did he score? **n + (2n - 3) = 135**
13 The Bruins' Bobby Orr set the league record for the most assists in one season by a defenseman, when he had **75% of 136** assists during the 1970-71 season. How many assists did he have?	**14** The Boston Bruins' Phil Esposito holds the league record for most shots on goal in one season with **2 x 5^2 x 11** shots on goal during the 1970-71 season. How many shots on goal did he make?
15 The Bruins' Ray Borque accumulated **35,000 x .01** regular season penalty minutes between 1979 and 1985. How many minutes of penalties is this?	**16** While playing for the Boston Bruins, Derek Sanderson wore number **2/3 x 30 - 20 + 5**. What was his number?

10 pts.

10 pts.

15 pts.

10 pts.

5 pts.

5 pts.

10 pts.

5 pts.

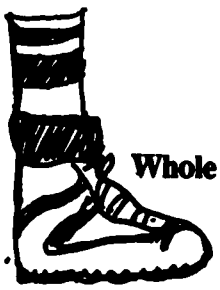
1 The Boston Celtics hold the record for consecutive World Championships at $36 + 4\ 1/2$. What is this record?	2 During the 1985-86 regular season all 38 Celtics home games were sellouts. This means that $(2 \times 3 \times 4 \times 5 \times 6 \times 7) + (2^2 \times 3^4 \times 5^2) + (2 \times 5^3 \times 7)$ people attended each home game. How many people is this?
3 The parquet floor of the Boston Garden is composed of $.6 \times 440$ pieces which are assembled and disassembled approximately 120 times per season. How many pieces are there?	4 The numbers of the Boston Celtics starters for 1985-86 were Robert Parish (00), Dennis Johnson (3), Larry Bird (33), Kevin McHale (32), and Danny Ainge (44). Find the average of these numbers to the nearest tenth.
5 En route to their 16th World Championship, the 1985-86 Celtics lost only 3 of 18 playoff games. What percent of their playoff games did they win?	6 Three Boston Celtics played on the Eastern Conference All-Star Team in 1986: Larry Bird (33), Kevin McHale (32), and Robert Parish (00). Find the product of their numbers.
7 Larry Bird began playing for the Boston Celtics in the year n. What year was this if $5n + 105 = 10{,}000$?	8 On February 27, 1959, while playing for the Celtics, Bob Cousy set the record for the most assists made in a half with 250% of 7.6. How many assists was this?

10 pts.

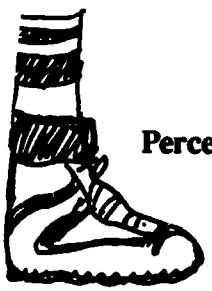
5 pts.

10 pts.

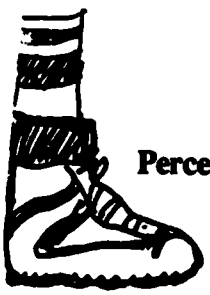
5 pts.



5 pts.



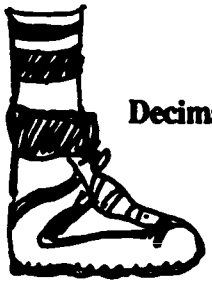
15 pts.



10 pts.

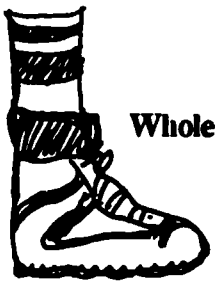
10 pts.

9 The Celtics' Bill Russell holds the career record for rebounds with $2^3 \times 3^3 \times 19$ in 13 years. How many rebounds is this?	**10** In the Boston Garden there are approximately **1986 + 1.986** obstructed view seats, depending on the configuration of the seats. How many obstructed view seats are there?
11 Red Auerbach coached the Boston Celtics for **80% of his 20** seasons in the NBA. For how many seasons did Red coach the Celtics?	**12** On January 4, 1985, the number **13.06 + 6.53** was hoisted to the rafters of Boston Garden in honor of Red Auerbach. What number was retired?
13 On January 10, **1081.68 + 885.32**, Red Auerbach became the only coach ever ejected from an NBA All-Star Game. What year was this?	**14** During the 1957 NBA All-Star Game at Boston Garden, Bill Sharman made an **n** foot shot while attempting to pass to Bob Cousy. How long was this shot if **10 is 12 1/2% of n**?
15 In what year was the Boston Garden built, if it was built in **1/2% of 385,600**?	**16** The most field goals attempted in one season was **1/2(3000 + 3/4) - 18** by Celtic John Havilcek during the 1970-71 season. How many field goals did he attempt?



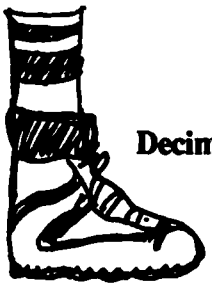
Decimals

5 pts.



Whole Numbers

5 pts.

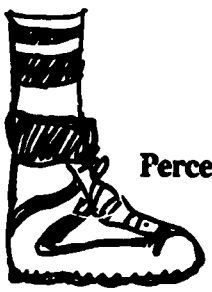


Decimals

10 pts.

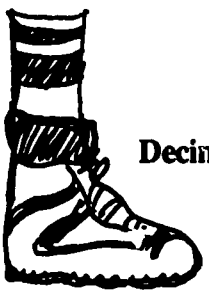
Percent

5 pts.



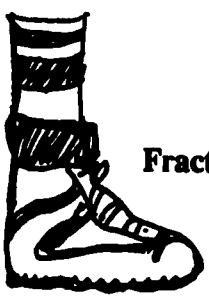
Percent

5 pts.



Decimals

5 pts.



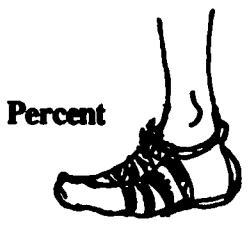
Fractions

10 pts.

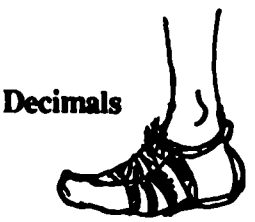
Percent

15 pts.

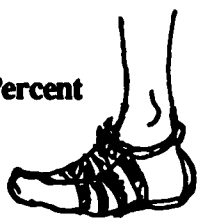
1 In 1985 there were 5595 official entries in the Boston Marathon. If each paid $10.00 to enter, how much was collected?	**2** In 1986 the Boston Marathon prize for coming in 10th was $2500, for 9th, $4000. The 10th place prize money is what percent of the 9th prize money?
3 The widest margin of victory for women in the Boston Marathon was 9 minutes 59 seconds. If the second place runner had a time of 3 hours 20 minutes 35 seconds, what was the winning time?	**4** The 5th place prize money in the Boston Marathon is 66 2/3% of the 3rd place prize money. If the fifth place prize is $10,000, how much does the 3rd place finisher receive?
5 First place prize money in the Boston Marathon is $2500 for wheelchair and $30,000 for runners. Express the ratio of wheelchair prize money to runner prize money as a reduced fraction.	**6** In 1968 only 1013 people entered the Boston Marathon. In 1985 there were 5595 entries. This is an increase of approximately: A) 18% B) 550% C) 450% D) 22% (choose one)
7 The closest finish ever in the Boston Marathon was in 1982 when only n seconds separated the first two runners. If n = .0002 x 10,000, find n.	**8** A very good time in the Boston Marathon is 2 1/5 hours. The course is about 26 1/5 miles. This represents a speed of about _____ (nearest 1/10 m.p.h.) Note: $R = \frac{D}{T}$



10 pts.

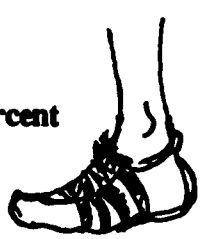


5 pts.



10 pts.

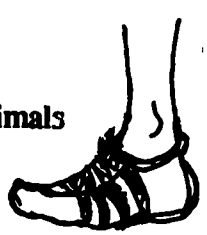
10 pts.



15 pts.

5 pts.

10 pts.



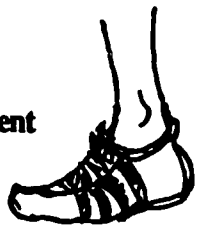
10 pts.

9 In 1985, **24.05%** of the runners in the Boston Marathon were in the 40-44 age bracket. If 5122 started, how many runners were in this age bracket?	**10** In the 1985 Boston Marathon, in the 55-59 age group, **(20% of 400) + (200% of 65)** finished. What fractional part (reduced) of the group finished?
11 The Boston Marathon has been run every year since 1897 except one. The year in which it was not run was $1 \times 10^3 + 9 \times 10^2 + 1 \times 10^1 + 8 \times 10^0$ or_____ __. Why might it not have been run in this year?	**12** The Boston Marathon passes through n cities or towns between Hopkinton and Boston. Find n if $4n - 3 = 21$.
13 The "Living Legend" of the Boston Marathon is John A. Kelley. He has run in **11/18 of the 90** marathons. How many times has he run? (He won twice and finished all but 3 times.)	**14** Bill Rogers has won the Boston Marathon in 2 hours 9 minutes 55 seconds (1975); the New York Marathon in 2 hours, 11 minutes, 42 seconds (1979); and the Houston Marathon in 2 hours 12 minutes 20 seconds. What was his average winning time in these three victories?
15 Joan Benoit ran the Boston Marathon in 2 hours 22 minutes 43 seconds in 1983. The 43 seconds was what percent of her total time? Give to the nearest .1 percent.	**16** The Framingham Railroad Station is the **2.5% x 270** mile mark in the Boston Marathon. How far have the runners gone when they pass this checkpoint?

Percent

10 pts.

Percent



10 pts.

Guess What?

10 pts.

Guess What?

5 pts.

Guess What?

15 pts.

Fractions

10 pts.

Percent

10 pts.

Percent

15 pts.

1 A sellout crowd at Boston Garden for Hockey is 14,482. A sellout at Fenway Park for a Red Sox game is 33,583. To the nearest .1%, a sellout crowd at Fenway Park is what percent of a sellout crowd at Boston Garden?	**2** The women's distance record for archery is a shot of 1039 yards. Express this distance to the nearest .1 meter given 1 yard is approximately equal to .91 meter.
3 In 1984 the United States had 159,089 bowling lanes in 8351 establishments. To the nearest hundredth, what is the average number of lanes in each bowling establishment?	**4** The longest boxing match in history lasted .2 of 550 rounds. It occurred in New Orleans in 1983, and lasted over 7 hours. How many rounds did it last?
5 If two sellout crowds of 33,583 from Fenway Park went to Sullivan Stadium which seats 61,000, how many people would be left standing?	**6** The world record for distance covered by a bicycle in 24 hours is 2×257.9 miles. This was done by a man from Finland in 1974. How many miles did he travel in one day?
7 In a 77 day period one man caught 3001 bass using a rod and reel. He threw all but 24 back. To the nearest whole percent, what percent of the bass he caught did he throw back?	**8** The largest swordfish ever caught weighed 1.182×10^3 lbs. Express this weight as a decimal numeral.

Decimals

10 pts.

Percent

15 pts.

Decimals

5 pts.

Decimals

10 pts.

Decimals

10 pts.

Whole Numbers

10 pts.

Guess What?

5 pts.

Percent

10 pts.

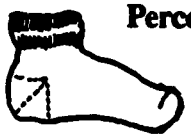
9 Checkers is an ancient sport which was played in Egypt in the second millennium B.C. The earliest book on the game was written in the year A.D. whose prime factorization is **17 x 13 x 7**. What year was this?	10 The longest golf course in the world is the International Golf Club in Bolton, Massachusetts. It is 299,700 inches long. How many yards long is it?
11 Boston had a pro tennis team called the Lobsters. Once they won a game 60-30. The winning score was what percentage of the losing score?	12 The most successful Jockey ever is Willie Shoemaker. His birthweight of 2 1/2 lbs. is what percent of his adult weight of 94 lbs.? (to the nearest tenth)
13 In 1985 a women's 500 meter speed skating record was set by Eiko Shishii of Japan with a speed of **1.91 + .327 + 44 + 2.653** seconds. What was her time?	14 Twin brothers, Phil and Steve Mahre of the United States won the gold and silver slalom skiing medals at the 1984 Olympics. Their times were less than 1 second apart. Phil's winning time was 20.19 seconds short of 2 minutes. What was his time?
15 The longest chair lift in the world is in New South Wales, Australia. It is 3.5 miles long and the ride takes from .75 to 1.25 hours depending on the weather. The speed of the chair lift in miles per hour ranges from _____ to _____ depending on the weather.	16 Swimming races are timed electronically to the nearest .01 second and yet there was a tie for a gold medal in the 1984 Olympics between two United States women in the 100 meter freestyle. Their equal times totalled 111.84 seconds when added together. What was the winning time?

Whole Numbers

5 pts.

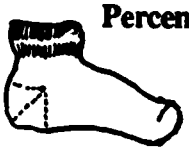
Whole Numbers

5 pts.



Percent

15 pts.

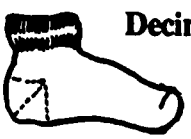


Percent

5 pts.

Decimals

10 pts.

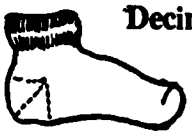


Decimals

10 pts.

Decimals

10 pts.



Decimals

15 pts.